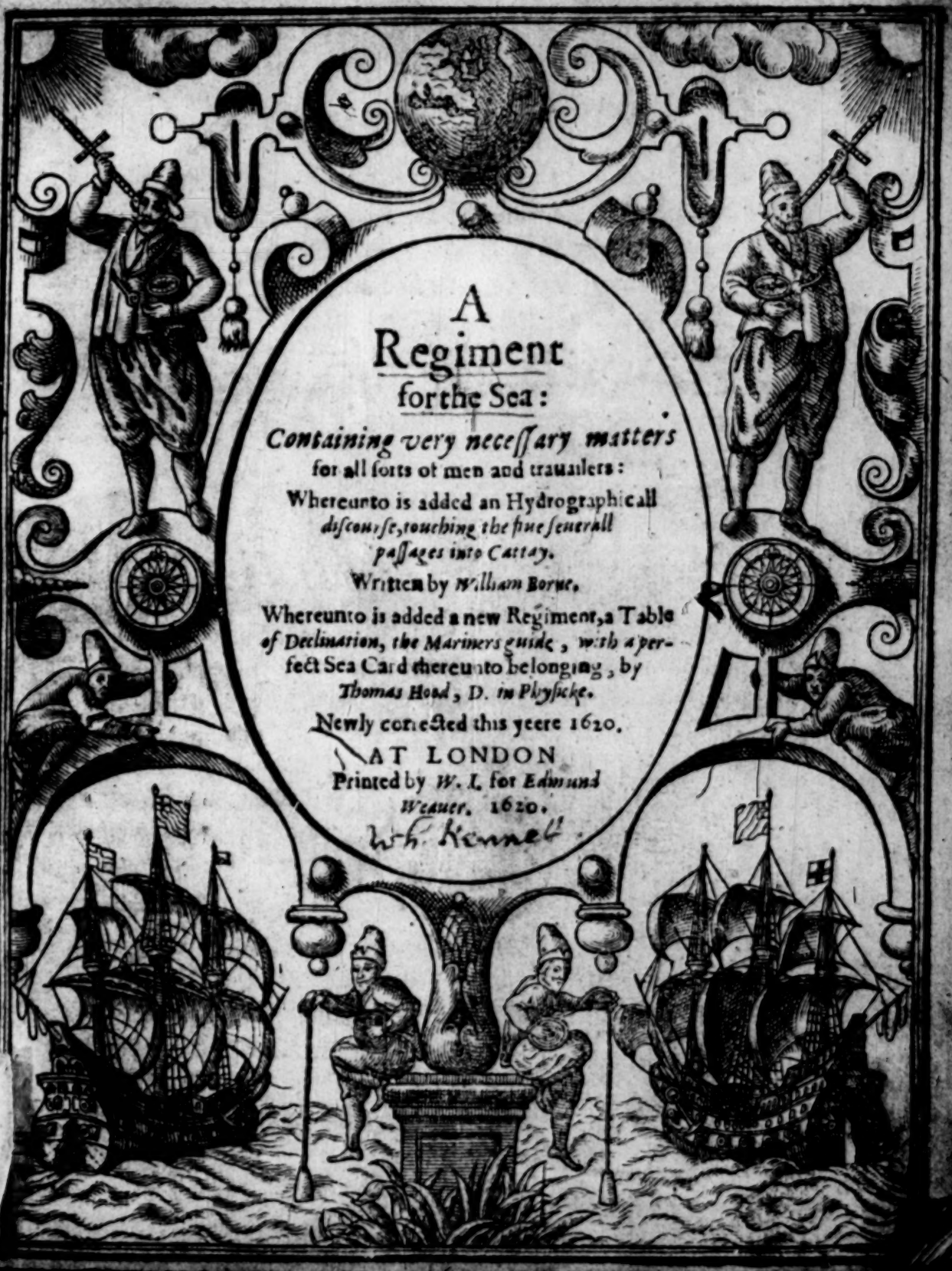


A Regiment for the Sea:

Containing very necessary matters for all sorts of men and trauailers:

Whereunto is added an Hydrographicall *discourse, touching the fine seuerall passages into Cattay.*

Written by *William Borne.*

Whereunto is added a new Regiment, a Table *of Declination, the Mariners guide, with a perfect* Sea Card thereunto belonging, by *Thomas Hood, D. in Physicke.*

Newly corrected this yeere 1620.

AT LONDON
Printed by *W. I.* for *Edmund Weauer.* 1620.

Wh. Kennett

To the right Honorable *George Earle of Comberland, Baron* Clifford

Lord Bromflet, Atton, Veſcio and Vypent;
Lord of Weſtmerland, and Knight
of the moſt honourable order of
the Garter, &c.

WHen this booke, Right Honorable, was firſt imprinted, it came forth vnder the Patronage of the Right Honorable *Edward* Earle of *Lincolne*, ſomtimes Lord high Admirall of England: That impreſſion being diſperſed it hath bin thought good, that the booke ſhould be corrected and put vnto the preſſe again, the labor was aſſigned vnto me: the which I was willing to vndertake, both becauſe it was earneſtly requeſted, and I adiudged it profitable for the common wealth: but being ready to come foorth, it wanted a Patron, which was not conuenient, being ſo honourably protected heretofore, and deſeruing now as well, as it hath alwayes done. Wherefore deuiſing with my ſelfe vpon this occaſion, to commend it to the honourable Tuition of ſome worthy man, I was mooued to dedicate it to your Honor: firſt by the general conſent of many who wiſh you well, and iudge you a fit patrone for ſuch a worke: ſecondly, by the houourable fauour, which (as occaſion hath beene of-

fered) I haue alwayes found at your Honors hands: thirdly, by the inclination of your mind to marine cauſes. If therefore (Right Honourable) the conſent of many, mine owne thankefull minde, whereof this is a ſigne, or your Honors inclination to theſe ſtudies, may either ſeuerally one by one, or iointly all together moue you to the tuition of this worke, it ſhall be ſufficiently defended (as I hope) from enuious tongues; and I (by your fauour) ſhall be inuited continually to employ my pen to the commoditie of my Countrey, and to make my prayer for your Honours daily increaſe in all good things,

Your Honours moſt humbly

affectionate,

Th. Hood.

To the Reader.

GOurteous Reader, I haue thought it good now in this Impression to amend or correct certaine faults that were in the first, but most speciallie in the second Impression: for that it was printed the second time, I not knowing thereof, so that it had not onely those faults that were printed out of the first written copie, but now a number of new faults, more than that it had in the first: wherefore I haue not onely mended and corrected those faults, but in like manner I haue added other necessary matters, not before this time printed, as this: What Eccentricity is, and also what Paralax is, and his vse, as it doth appeare in the first folio of the booke. And also I haue in like manner shewed how that Sea-men shall know when that the Moone is in hir slow and swift motion, which is known by the Prime, as it is declared in the third Chapter. And also how for to know the Moones Latitude, as it is shewed in the fourth Chapter. And also I doe shew in the fifth Chapter, the cause that there is more dayes frō the Equinoctial of March vnto the Equinoctiall of September, then there is from the Equinoctiall of September vnto the Equinoctiall of March. And also I haue added vnto the tenth Chapter, certain matters as touching discoueries vnto the North parts. And furthermore, I haue shewed in the fourteenth Chapter, how for to know how fast or softly that any Ship doth goe, and how for to keepe a perfect account of the ships way. And also I haue altered cleane the seuenteenth Chapter, and shewed how that the sea-men shal know what part or quantity that they haue passed or gone of the whole earth; whereby that they should know the diuersitie of aspects, as the Eclipses of the Moone, and the alteration of time; and also I haue added diuers things in sundry places of the Booke, that I doe omitte for breuity. And in like manner I haue added vnto the end of the booke an hydro-

graphicall discourse for to goe vnto Cattay fiue seuerall or sundrie wayes, that is to say, the first way is about by Cape bone sperance, which is that way that the Portugals goe vnto Calicut, and vnto the Moluccas, and other places in the East Indies: The second way is through the straights of Magelane, into the South sea. The third way is towards the Northwest, whereas Captaine Frobisher, and Christopher Hall, hath begunne the discouerie now called Meta Incognita. And the fourth way is by the Northeast by the coast of Noua Zembla, that Master Stephen of Borole hath begunne that discouery. And the fifth way is by the North Pole, if that it be Nauigable, &c.

Now it is possible that I may bee enuied of diuers and sundry people, for that I haue written this discourse of the passages vnto Cattay, for that the nature of a number of men is, to dislike of all things not done by themselues: But notwithstanding all is one vnto me, whether they do like or dislike. For that I doe know some persons haue already made euill report of that I haue written before this time, yet notwithstanding I wil not stay my pen for their malice: for although their skill is much more then mine, my meaning is not to teach any of them, but to instruct the simplest sort of seamen, and to shew vnto them such things as are necessary for them for to know. And also some sort of people are of that nature, if that they write or talke of any things past their capacitie, then they will say that hee can talke well, but they themselues cannot talke, but they can doe; but this is the truth, whatsoeuer he be that will say that he can do any thing, and if that hee cannot shew the reason of the doing thereof, I doe say vnto you hee cannot doe it, and this is most certaine, for if that he doth it, he doth it but by fortune, euen as he that drew his bow by chance in the Assyrians hoast and slew Achab the King of Israel, as wee do reade in the third booke of the Kings, and the last Chapter, when that Iosaphat the King of Iuda, and Achab King of Israel, went to battaile against Ramoth in Gilead.

For

To the Reader.

For this is generall amongst Sea-men and also Gunners, how simple or without skill soeuer that they be, if that they haue once taken charge to be the Master of a Ship, hee thinketh great scorne to learne at any mans hand, but will bragge of himselfe how long hee hath been a Master, and God knoweth vtterly without skill, but that he is a Coaster, and doth knowe the markes for to carry a Ship ouer the Lands end, and ouer the Naase.

But good simple men, if that they could not doe that, then there were nothing in them: For euery man must nèds be skilfull and know that place, that a number of times hee hath occupied, and hath ben taught vnto him.

And who doubteth but a simple Fisherman of Barking, knoweth Barking Creke, better than the best Nauigator or Master in this land; so who doubteth, but these simple men doe know their owne places at home: But if they should come out of the Ocean Sea to seeke our Channell, to come vnto the Riuer of Thames, I am of that opinion, that a number of them doth but grope as a blind man doth, and if that they doe hit well, that it is but by chance, and not by any cunning that is in them.

But I doe hope that in these dayes, that the knowledge of the Masters of Ships is very well mended, for I haue knowne within these 20. yeeres, that they that were auncient Masters of Ships haue derided and mocked them that haue occupied their Cardes and Plattes, and also the obseruation of the Altitude of the Pole, saying: that they care not for their Sheepes skinnes, for he could keepe a better account vpon a boord.

And when that they did take the Latitude, they would call them Starre-shoters, and Sunne-shoters, and would aske if they had stricken it. Wherefore now iudge of their skills, considering that these two points are the principall mattters in Naugation. And yet these simple people will make no small bragges of themselues, saying: that he hath been Master this twentie yeeres, and neuer had no misfor-

turne; and also if that they could heare of any that did vse plats and instruments, that had any misfortune, then they would not a little brag of themselues, what notable fellows they themselues were.

O what a notable follie was in these men, not considering what they themselues were! For this is most certaine, that it is not wisedome nor cunning that can preuent or alter Gods prouidence; if that it please him to lay his scourge vpon vs. For if that men through cunning could prouide that no misfortune should happen vnto them, then were they Gods, and not men; and yet notwithstanding we must not condemne cunning and knowledge; but put all things vnto fortune, then you may take one from the plough, and make him master of a ship, and say, he hath good fortune. And thus (gentle Reader) I ceasse, requesting thee to accept this as a simple present, proceeding of good will.

Tine *W. B.*

FOR

FOR that the common people doe fall into such a number of errours as touching the length of the day, holding an opinion, that in euery 15. daies, the day is an houre longer or shorter, the truth is this: the day doth keepe no such proportion in the lengthning and shortning, but doth lengthen and shorten according vnto the swiftnesse and slownesse of the Sunnes declination: for when the Sunne hath swift declination, then doth the day lengthen and shorten apace; and when that the declination is slow, then doth the day lengthen or shorten but slowlie. And yet the most part of the common people doe hold an opinion, that at Christmasse or else at New yeares day at the furthest, the day must needes be an houre longer, and yet the Sunne hath not declined or come towards the Equinoctiall two degrees and a halfe, which will not make halfe an houre in the length of the day: wherefore I doe thinke it good to declare through the whole yeere, when the day is an houre longer or shorter here in this place, for the latitude or height of the Pole articke at London, the Pole being raised fiftie one degrees, thirtie two minutes, or thirtie foure minutes: and our longest Summer day is sixteene houres and a halfe, and our shortest Winter day is seauen houres and a halfe, from the rising of the Sunne vnto the setting of the Sunne: and first this: the shortest Winter day, is the 11. or 12. day of December, and the Sunne riseth a quarter of an houre after eight, and setteth a quarter of an houre before foure of the clocke, and the Sunne hath his greatest declination vnto the Southwards. The 29. day of December, the day is a quarter of an houre longer, and the sunne riseth at eight of the clocke, and setteth at foure. The 17. or 18. of Januarie, the day is an houre longer, and not before, for the sunne must bee declined from his Solstice of winter fiue degrees and twelue minutes, before the day is lengthened an houre; so that I doe affirme, that from the fourth or fift day of November, vnto the 17. or 18. day of Januarie, in all that time

the day is but one houre shorter or longer, which is the time of ten weekes. The 27. or 28. of Ianuarie the night is fifteene houres long, then riseth the Sunne halfe an houre after seauen, and setteth halfe an houre after foure of the clock. The seauenth or twelfth day of Februarie the day is ten houres long, then riseth the Sunne at seauen, and setteth at fiue of the clock. The six and twentie day of Februarie the day is aleauen houres long, then riseth the Sunne halfe an houre after sixe, and setteth halfe an houre after fiue of the clocke. The eleauenth day of March, then the Sunne is in the Equinoctiall, and the day iust 12. houres long all the world ouer. The 24. day of March, the day is 13. houres long, and then riseth the Sunne halfe an houre before sixe, and setteth halfe an houre after sixe of the clock. The seuenth day of Aprill the day is foureteene houres long, and then riseth the Sunne at fiue of the clock iust, and setteth at seauen of the clocke iust. The 23. day of Aprill the day is fifteene houres long, and then riseth the Sun halfe an houre before fiue, and setteth halfe an houre after seauen of the clocke. The 15. day of May the day is 16. houres long, then riseth the Sunne at foure of the clocke, and setteth at eight of the clocke iust. The eleuenth of June the Sunne hath his greatest declination to the Northward, and then is our longest summer day consisting of sixteene houres and a halfe from the Sun rising vnto the Sunne setting, so that the sunne riseth a quarter of an houre before foure, and setteth a quarter of an houre after eight of the clocke. The tenth day of July, the day is sixteene houres long, then riseth the sunne at foure and setteth at eight of the clock. The last day of July, the day is fifteene houres long. The 16. day of August the day is foureteene houres long. The last day of August the day is 13. houres long. The thirteene or foureteene of September the sunne is in the Equinoctiall, and the day is iust twelue houres long. The 27. day of September the day is 11. hours long. The 11. day of October the day is ten houres long. The 26 day of October the day is nine houres long. The 15.

day

day of November the day is eight houres long: and so vnto the 11. or 12. day of December, at which time the day is at the shortest, as before is declared.

Thus much haue I said, as touching the length of the day by euen houres, which some people will haue at the entrance of the Sunne into the 12. signes, but it is not so; yet this you may obserue, that when the Sunne hath declined fiue Degrees and twelue Minutes in this our Latitude, then is the day one houre longer or shorter. You shall finde this matter more largely spoken of, concerning the length of the day in all places thorough the world, in the 11. Chapter of the Booke.

A Table of the reigne of Kings since the Conqueſt.

Number of Kings and Queenes	The Names of the Kings of England	Beginning of their Reigne.	Time of their death.	The place of their buriall
1	William Conqueror	14 Oct.	9 Sept. 1087	Caen in Nor.
2	William Rufus	9 Sept.	1 Aug. 1100	Weſtminſt.
3	Henrie the firſt	1 Aug.	2 Dece. 1136	Reding
4	Stephen	2 Dece.	25 Oct. 1154	Feuerſham.
5	Henrie the ſecond	25 Oct.	6 July 1189	Fonteuerard
6	Richard the firſt	6 July	6 April 1199	Fonteuerard.
7	Iohn	6 April	19 Oct. 1216	Worceſter.
8	Henrie the third	19 Oct.	16 Nou. 1272	Weſtminſt.
9	Edward the firſt	16 No.	6 July 1307	Weſtminſt.
10	Edward the ſecond	6 July	25 Jan. 1327	Gloſter.
11	Edward the third	25 Jan.	21 Jun. 1377	Weſtminſt.
12	Richard the ſecond	21 June	16 Sep. 1400	Weſtminſt.
13	Henrie the fourth	16 Sep.	20 Mar. 1413	Canterburie.
14	Henrie the fift	20 May	31 Aug. 1422	Weſtminſt.
15	Henrie the firſt	31 Aug.	4 Mar. 1461	Winſore.
16	Edward the fourth	4 Marc.	9 April 1483	Winſore.
17	Edward the fifth	9 April	22 Jun. 1484	Weſtminſt.
18	Richard the third	22 June	22 Aug. 1486	Leyceſter.
19	Henrie the ſeuenth	22 Aug.	22 Apr. 1509	Weſtminſt.
20	Henrie the eight	22 April	28 Jan. 1547	Winſore.
21	Edward the firſt	28 Jan.	6 July 1553	Weſtminſt.
22	Quéene Marie	6 July	17 Nou. 1558	Weſtminſt.
23	Quéene Elizabeth	17 Nou.	24 Mar. 1602	Weſtminſt.
24	James.	24 Mar.		

The Kalender.

			January hath xxxi. dayes.				February hath xxviij. dayes, and in the yeere of Bissextilis xxix. daies.
3	1	a	New yeeres day		1	d	Brigit. Fast
	2	b	Octa. Stepha.	11	2	e	Puri. of Mary.
11	3	c	Octa. John	19	3	f	Blase mar.
	4	d	Octa. Inno.	8	4	g	Eilbert Confess.
19	5	e	Thesolopho hi.		5	a	Agathe virgin
8	6	f	Twelfe day.	16	6	b	Dorothy virgin
	7	g	Julian martyr	5	7	c	Amandus bishop
16	8	a	Severine bishop		8	d	Salomon
5	9	b	Martian virgin	13	9	e	Sunne in Pisces.
	10	c	Paule first her.	2	10	f	Sother bishop
13	11	d	Sunne in Aquar.		11	g	
2	12	e	Satire martyr	10	12	a	Euphrase virgin.
	13	f	Oct. Epipha.		13	b	Valentine bishop
10	14	g	Isidors maty.	18	14	c	Faustine bishop
	15	a	Maurice	7	15	d	Julian virgin
18	16	b	Anthony Abbot		16	e	Constance Virgin
7	17	c	Marcelle bishop	15	17	f	Simeon martyr
	18	d	Prisce bishop	4	18	g	Gabine Priest
15	19	e	Mari and his fel.		19	a	
4	20	f	Fabian and Sa.	12	20	b	60. Martyrs
	21	g	Agnes virgin	1	21	c	70. Martyrs
12	22	a	Vincent martyr		22	d	Peters Chayre
1	23	b	Emerice	9	23	e	Sirener. Fast
	24	c	Timothy discip.		24	f	Mathias Apostle
9	25	d	Con. of Paule	17	25	g	Policar bishop
	26	e	Policarp martyr	6	26	a	Victor and his fel.
17	27	f	Chrisost. Doct.		27	b	Augustine bishop.
6	28	g	Theodore	14	28	c	Oswale bishop.
	29	a	Valerie bishop				
14	30	b	Tran. S. Marke				
3	31	c	Circ. and Jan.				

March hath xxxj. dayes.

3	1	d	Dauid bishop
	2	e	Basilic martyr
11	3	f	Marine martyr
	4	g	Lucins martyr
19	5	a	Focius martyr
8	6	b	Vict. and venin.
	7	c	Tho. de Aquin.
16	8	d	Apoline martyr
5	9	e	40. Martyrs
	10	f	Gregorie bishop
13	11	g	Sunne in Aries
2	12	a	Zachary bishop
	13	b	Longine mar.
10	14	c	Patritius bishop
	15	d	Gertrude virgin
18	16	e	Anselme
7	17	f	Edward King
	18	g	Joseph spons.
15	19	a	Cutbert bishop
4	20	b	Benedict Abbot
	21	c	Affrodose bishop
12	22	d	Pigment bishop
1	23	e	Theodore
	24	f	Fast
9	25	g	Annun. of Mary
	26	a	Castore martyr
17	27	b	John Heremy
6	28	c	Dorothy martyr
14	29	d	Eustace.
3	30	e	Sabine virgin
	31	f	Balbine virgin

Aprill hath xxx. dayes.

	1	g	Theodore virgin
11	2	a	Mary Egyptian
19	3	b	Richard bishop
8	4	c	Ambrose bishop
	5	d	Marci. and Ma.
16	6	e	Sertus martyr
5	7	f	Euphemi. virgin
	8	g	Denise mar.
13	9	a	Perpetuus bishop
2	10	b	Mercus martyr
	11	c	Sunne in Turus
10	12	d	Apoline martyr
	13	e	Wother mar.
18	14	f	Tiburt martyr
7	15	g	Osmond bishop
	16	a	Isidore bishop
15	17	b	Anicete bishop
4	18	c	Celuther bishop
	19	d	Tiburtius Conf.
12	20	e	Hermogenes
1	21	f	Quintine.
	22	g	Clete bishop
9	23	a	George martyr
	24	b	Wilfride Conf.
17	25	c	Marke Euangelist.
6	26	d	Anastace bishop
	27	e	Vitalis martyr
14	28	f	Peter of Pi.
3	29	g	Clete bishop
	30	a	Dep. of Ecken.

The Kalender.

May hath xxxi. dayes.

11	1	b	Philip and Iacob
	2	c	Athnatius bish.
19	3	d	Inu. of the crosse
8	4	e	Christopher
	5	f	S. Augustine
16	6	g	John Portlat.
5	7	a	John of Beuer.
	8	b	Appe. of Wich.
13	9	c	Transl. of Ni.
2	10	d	Gordaine
	11	e	Sunne in Gemini
10	12	f	Victorius Martyr
	13	g	Seruatius Conf.
18	14	a	Boniface martyr
7	15	b	Sophia Virgin
	16	c	Brandon bishop
15	17	d	Transl. of Bar.
4	18	e	Dioscor matyr
	19	f	
12	20	g	Dunstance Conf.
1	21	a	Barnardine
	22	b	Helene Quéene
9	23	c	Petronil.
	24	d	Julian virgin
17	25	e	Desidere martyr
6	26	f	Adelme Conf.
	27	g	
14	28	a	Germaine bishop
3	29	b	Nicodeme
	30	c	Corne martyr
11	31	d	Felix bishop

Iune hath xxx. dayes.

19	1	e	Nicodeme
8	2	f	Erasmus
	3	g	Basill
16	4	a	Marcel martyr
5	5	b	Petrocius conf.
	6	c	Boniface bishop
13	7	d	Medard and gil.
2	8	e	Transl. Edmond
	9	f	Yuan Conf.
10	10	g	Transl. of Wol.
	11	a	Barnabe Apostle
18	12	b	Sunne in Cancer.
7	13	c	Anthony Conf.
	14	d	Basilides Conf.
15	15	e	Vate modeste
4	16	f	Transl. Richard
	17	g	Botulph Conf.
12	18	a	Eruperie Bishop
1	19	b	Gerualius martyr
	20	c	Transl. Edward
9	21	d	Walburge virgine
	22	e	Albane martyr
17	23	f	Fast
6	24	g	Iohn Baptist
	25	a	Transl. of Elig.
14	26	b	Iohn and Pa.
3	27	c	Crescens martyr
	28	d	Fast
11	29	e	Peter and Paule
	30	f	

Iuly, hath xxxj. dayes.				August hath xxxj. dayes			
19	1	g	Octa. Iohn Bap.	8	1	c	Lammas
8	2	a	Visit. of Mary	16	2	d	Stephen bishop
	3	b	Gregorie bishop		3	e	Finding of Ste.
16	4	c	Domitius martyr	5	4	f	Iustine Priest
5	5	d	Parthene Conf.		5	g	Festum niuis
	6	e	Procope martyr	13	6	a	Trans. Domini.
13	7	f	Zenone martyr	2	7	b	Feast of Iesu
2	8	g	Paterian bishop		8	c	Cuthbert & his fel.
	9	a	Pius bishop	10	9	d	Roman martyr
10	10	b	Dog daies begin.		10	e	Laurence martyr
	11	c	Herinaco. for.	18	11	f	Tiburt and Su.
18	12	d	Anaclete bishop	7	12	g	Clare virgin
7	13	e	Murine and Iu.		13	a	Ypolite virgin
	14	f	Sunne in Leo	15	14	b	Sunne in Virgo
15	15	g	Marine virgin	4	15	c	Assump. of Mary
4	16	a	Simph. cum 7.		16	d	Roche Conf.
	17	b	Arlene hem.	12	17	e	Octa. Laurence
12	18	c	Prarede virgin	1	18	f	Agapite martyr
1	19	d	Margar. virgin		19	g	Lewis bishop
	20	e	Prarede virgin	9	20	a	Dog daies end
9	21	f	Apoline bishop		21	b	Anastase martyr
	22	g	Mary Magdalene	17	22	c	Timo. and Hip.
17	23	a	Christian	6	23	d	Eleazor Fast
6	24	b	Fast		24	e	Barthol. Apost.
	25	c	Iames Apostle	14	25	f	Lewis King
14	26	d	Anne mo. of Mary	3	26	g	Zepherine bishop
3	27	e	Panthalcon.		27	a	Rufus martyr
	28	f	Sampson bishop	11	28	b	Augustine bishop
11	29	g	Mary virgin		29	c	Iohn beheaded
	30	a	Abbo. and sen.	19	30	d	Felix and Auda.
19	31	b	German bishop		31	e	Cuthber virgin.

The Kalender.

September hath xxx. dayes.				October hath xxxi. dayes.			
8	1	f	Giles Abbot	16	1	a	Remegius bishop
16	2	g	Anthony martyr	5	2	b	Leodegar martyr
5	3	a	Euphemie	13	3	c	Candide martyr
	4	b	Moses Pro.	2	4	d	Frances mar.
13	5	c	Venturine		5	e	Faith Virgin
2	6	d	Zacharie Prop.	10	6	f	Gerionis
	7	e	Enurce bishop		7	g	Marce and mar.
10	8	f	Nativity of Ma.	18	8	a	Apolinaris mar.
	9	g	Gorgone martyr	7	9	b	Pelagi Virgin.
18	10	a	Nicolas de To.		10	c	Linus Confess.
7	11	b	Protece and Hi.	15	11	d	Denice & his fel.
	12	c	Hire bishop	4	12	e	Nichasius bishop
15	13	d	Philip bishop		13	f	Wilfride bishop
4	14	e	Sunne in Libra.	12	14	g	Sunne in Scorpio
	15	f	Nicodeme priest	1	15	a	Talirt bishop
12	16	g	Edith Virgin		16	b	Wolfran bishop
1	17	a	Lambart bishop	9	17	c	Rich. of the mount
	18	b	Victor and Cor.		18	d	Luke Euangelist.
9	19	c	Eustace	17	19	e	Etheldred virgin.
	20	d	Fast	6	20	f	Friswide virgin
17	21	e	Mathew Apostle.		21	g	Austrebet virgin
6	22	f	Maurice	14	22	a	vi. M. virgins
	23	g	Line martyr	3	23	b	Mary Salome
14	24	a	German Abbot		24	c	Romans bishop
3	25	b	Cleophin and Ap.	11	25	d	Maglore bishop
	26	c	Cyprian and Iul.		26	e	Chrisp. and Chris.
11	27	d	Cosme and Da.	19	27	f	Fast.
19	28	e	Erupere bishop	8	28	g	Simon and Iude.
	29	f	Michael Arch.		29	a	Narcissus bishop
8	30	g	Hierome Doct.	16	30	b	Germaine Conf.
				5	31		Fast.

The Kalender.

			Nouember hath xxx. daies.				December hath xxxj. daies.
	1	d	All Saints		1	f	Elegi bishop
13	2	e	All Soules	13	2	g	Liban martyr
2	3	f	Winefride virg.	2	3	a	Dep. of Dmond
	4	g	Amantius		4	b	Barbara virgin
10	5	a	Lete Priest	10	5	c	Sabba bishop
	6	b	Leonard		6	d	Nicolas bishop
18	7	c	Wilborde	18	7	e	Octa. Andrew
7	8	d	Foure crowned	7	8	f	Con. of Mary
	9	e	Theodore		9	g	Cyprian bishop
15	10	f	Marine	15	10	a	Eulalie virgin
4	11	g	Martine bishop	4	11	b	Antype
	12	a	Brise bishop		12	c	Damase Conf.
12	13	b	Sunne in Sagit.	12	13	d	Sun in Capricor.
1	14	c	Tran. Erkenew	1	14	e	Nicasius virgin
	15	d	Macute bishop		15	f	Othalie virgin
9	16	e	Dep. of Edmond	9	16	g	O Sapientia
	17	f	Init Reg. Eliza.		17	a	Lazarus Conf.
17	18	g	Octa Martine	17	18	b	Gratian bishop
6	19	a	Elizabeth mar.	6	19	c	Venetian virgin
	20	b	Edmond King		20	d	Fast
14	21	c	Pres. of Mary	14	21	e	Thomas Apostle
3	22	d	Cicely virgin	3	22	f	xxx. Martyrs
	23	e	Clement mar.		23	g	Victor virgin
11	24	f	Grisogon mar.	11	24	a	Fast
19	25	g	Catherine virg.		25	b	Christmas day
	26	a	Line martyr	19	26	c	Stephen martyr
8	27	b	Vitalis Conf.	8	27	d	Iohn Euangelist
	28	c	Rufus mar.		28	e	Innocents day
16	29	d	Saturni. Fast	16	29	f	
5	30	e	Andrew Apostle.	5	30	g	Tran. of James
				13	31	a	Siluester martyr.

Heereafter followeth a moſt excellent, neceſſary and compendious Kalender, ſhewing the Prime, Epact, Dominicall Letter, Leape yeares, and moueable Feaſts, for 24. years, Incluſiuely comprehending therewith the true day and houre of the Moones Coniunction or change, for 19 yeares to come, with the true place of the Sun, and his Declination from the Equinoctiall, both Northwards, and Southwards vpon euery degree thereof, through the 12. moneths of the Yeere.

Yeare of our Lord	Prime.	Epact.	Sunday Letter.	First Sunday in Lent	Easter day.	Aſcen. day.	Whit-ſunday.	Trinity Sunday.
1616	2	22	G F	Febr. 18	Mar. 31	May. 9	May 19	May 26
1617	3	3	E	March 9	Apri. 20	29	Iune 8	Iune 15
1618	4	14	D	Febr. 22	5	14	May 24	May 31
1619	5	25	C	14	Mar. 28	6	16	23
1620	6	6	B A	March 5	Apri. 16	25	Iune 4	Iune 11
1621	7	17	G	Febr. 18	1	10	May 20	May 27
1622	8	28	E	Mar. 10	21	30	Iune 9	Iune 16
1623	9	9	F	2	13	22	1	8
1624	10	20	D C	Febr. 15	Mar. 28	6	May 16	May 23
1625	11	1	B	March 6	Apri. 17	26	Iune 5	Iune 12
1626	12	12	A	Febr. 26	9	18	May 28	4
1627	13	23	G	11	Mar. 25	3	13	May 20
1628	14	4	F E	2	Apri. 13	22	Iune 1	Iune 8
1629	15	15	D	Febr. 22	5	14	May 24	May 31
1630	16	26	C	14	Mar. 28	6	16	23
1631	17	7	B	27	Apri. 10	19	29	Iune 5
1632	18	18	A G	18	1	10	20	May 27
1633	19	29	F	Mar. 10	21	30	Iune 9	Iune 16
1634	1	11	E	Febr. 23	6	15	May 25	1
1635	2	22	D	15	Mar. 29	7	17	May 24
1636	3	3	C B	March 6	Apri. 16	25	Iune 4	Iune 11
1637	4	14	A	Febr. 26	9	18	May 28	4
1638	5	25	G	7	March	3	13	May 20
1639	6	6	F	27	Apri. 14	23	Iune 2	Iune 9

A profitable and necessary rule to know the beginning and ending of euery Tearme, with their Returnes.

Hillarie Tearme beginneth the xxiii. of January, if it bee not Sunday, which then is referred vntill the next day after, and endeth the xi. of Februarie, and hath foure Returns, that is to say:

Octauis Hillarij	Crastino Purific.
Quind. Hillarij	Octauis Purific.

Easter Terme beginneth xviij. daies after Easter, and endeth the Munday next after the Ascention day, and hath fiue Returnes, that is to say:

Quind. Pasch.	Mens.	Quinque Paschæ.
Tres Paschæ.	Paschæ.	Crast. Ascention.

Trinity Terme beginneth the fryday next after Trinitie Sunday, and endeth the Wednesday fortnight after, and hath foure Returnes, that is to say:

Crast. Trinitatis.	Quind. Trinitatis.
Octauis Trinita.	Tres Trinitatis.

Michalmas Terme beginneth the ix. day of October, if it be not Sunday, and endeth the xxviij, or xxix. of Nouember, and hath eight Returnes, that is to say:

Octauis Michael.	Crast. Animarum.
Quind. Michael.	Crast. Martini.
Tres Michaelis.	Octa. Martini.
Mense Michael.	Quind. Martini.

Note also, that the Exchequer openeth eight daies before any tearme begin, except Trinitie tearme, which openeth but foure dayes before.

Thirty daies hath September, Aprill, Iune, and Nouember.
February hath xxviij. alone: and all the rest thirty and one.

Regiment for the SEA.

¶ The names of certaine things, necessary to be knowne of them that are Marriners or Seafaring men, meete to bee known of them that doe practise Nauigation, as this: the names of the circles of the Sphere, and what they are, and their vses: and also the names of other things belonging thereunto, and what they are, and their vses.

First, what the Horizon is.

THE Horizon is a great circle of the Globe, diuiding the part of the world seene, from the part vnseene; and this Horizon is changed when you doe moue: for as you doe by trauaile change your place, so doeth the Horizon alter continually.

The vse of the Horizon circle.

The vse of the Horizon is this; the height of the Sunne or any Starre is counted from it vpward, the which height is taken with the crosse staffe, setting the one ende with the Horizon, and the other ende with the Sunne or Starre, so that you haue a true Horizon: The which true Horizon is to bee found onely at the Sea, or else vpon a very plaine ground vpon the top of a hill. Moreouer if the Sunne or Moone, or any Starre be to be seene, then they be aboue the Horizon: if they be not to be seene, then they be vnder the Horizon.

2. What the Meridian is.

The Meridian is a great circle beginning due South, and so passing by your Zenith, that is right ouer the crowne of your head, and so by the two Poles of the world: and if you doe trauaile due South and North, you doe not

change your Meridian: but in the going or trauailing any other way, you doe change it.

The vse of the Meridian circle.

The vse of the Meridian Circle is, to know the iust time of noone by the Sunne: for as soone as the middle of the Sunne is in the Meridian, then it is noone; and when the Sunne, Moone, or any Starre is in the Meridian, then they be farthest from the Horizon, and it is a meete time to take their height, for to know the Altitude or height of the Pole of the world, whereby you may perfectly knowe, how farre you be to the Southwards, or Northwards of any place.

3. What the Equinoctiall circle is.

The Equinoctiall is a great circle in the heauens, equally distant from both the Poles, and doeth passe directly ouer the middle of the earth round about; and is called the Equinoctiall, for that if the Sunne be there, then throw all the whole world the sunne is 12 houres aboue the Horizon, and 12. houres vnder the Horizon, sauing vnder the two Poles, where the Equinoctiall is confident with the Horizon. So they shall see halfe the sunne and no more, till the sunne be departed from the Equinoctiall; and also to them that doe inhabite or dwell in any place vnder the Equinoctiall, the Sunne, Moone, and all the Starres, be twelue houres aboue the Horizon, and twelue houres vnder the Horizon.

The vse of the Equinoctiall circle.

The vse of the Equinoctiall, is to know what declination the sunne or any other starre hath from it, and on which side, by the which declination the height of the Equinoctiall is knowne, and by the height of the Equinoctiall is knowne the height of either of the two Poles of the world.

4. What the circle or Tropicke of Cancer is, being a parallel circle.

The

The Tropicke of Cancer, is a lesser circle of the Spheare, limiting the greatest declination that the Sunne doth come vnto Northwards, and then is our longest summer day, and shortest night.

5. VVhat the circle or Tropicke of Capricorne is, being a parallel circle.

The Tropicke of Capricorne, is a lesser circle, limiting the greatest declination that the Sunne hath Southwards, and then is our shortest winter day, and longest night.

The vses of these two circles be but small, but that the sunne comming vntothem, the daies be at the longest or shortest, and the sunne doth then returne backe againe, &c.

6. VVhat the Arcticke circle is, being a parallel circle.

The Arcticke circle is a lesser circle of the Spheare touching the Horizon due North, encreasing and diminishing according to the altitude or height of the Pole: for as you doe goe vnto the South parts, then doth your Arcticke circle grow narrower and narrower, vntill you come right vnder the Equinoctiall line, and then haue you no Arcticke circle: and if that you doe goe vnto the North parts, then doth your Arcticke circle growe wider and wider: where the North Pole is raised 66. degrees & a halfe, there the Arcticke circle and the Tropicke of Cancer are both one, and vnder the North Pole, your Arcticke circle and the Equinoctiall are both one.

The vse of the Arcticke.

The vse of the Arcticke circle, is to know what starres doe neuer set vnto you, for all these starres or lights that you doe see betweene it and the Pole, doe not set: and if that the North Pole be raised more then 66. degrees and a halfe, the Sunne or Moone being in the Tropicke of Cancer, shall not goe downe vnder the Horizon, but shall be still in sight vnto you, so that they be not let by the cloudes and other accidents.

7. What the Antarcticke circle is, being a Parallel circle.

The Antarcticke circle doth touch the Horizõ due South, and is opposite or right against the Arcticke circle, and doth widen and narrow in all points as the Arcticke circle doth, not differing from it, saving that the Arcticke circle is aboue the Horizon, and the Antarcticke circle is vnderneath the Horizon.

The vse of the Antarcticke circle.

The vse of the Antarcticke circle, is to knowe what starrs will not appeare aboue your Horizon, so that to the Northwards of 66. degrees and a halfe, the Sunne or Moone being in the Tropicke of Capricorne will not rise aboue the Horizon.

§. VVhat the Zodiacke is being a circle.

The Zodiacke is a great circle in the heauens, vnder the which all the wandring lights or Planets doe keepe their courses, that is to say, the Sunne and Moone, and the other fiue Planets or Starres; Saturne, Iupiter, Mars, Venus, and Mercurie. This circle is diuided into twelue equall parts called the xii. Signes: which are these; Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra Scorpio, Sagittarius Capricornus Aquarius, Pisces; the said circle standeth oblique or awrie, crossing the Equinoctiall in the middle at two places: and is 12. degrees broad, that is to say, sixe degrees from the middest Northward, and sixe degrees vnto the Southward.

The vse of the Zodiacke.

The vse of the Zodiacke is to knowe in what signe the Sunne and Moone, and the other Planets are, and also to knowe the time of the change of the Moone, with all the other aspects: and in like manner to knowe the aspects of all

all the other Planets vnto the Moone, also the Planets amongst themselues: and by the aspects in the xij. signes is gathered their effects, and in what Countrie they may happen.

9. What the line Ecliptick is.

The line Ecliptick is a Circle in the very middle of the Zodiacke, vnder the which the very middle or center of the Sunne doth continually moue.

The Vse of the line Ecliptick.

The vse of the line Ecliptick is this, if that the Moone or any other Starre, bee vnto the North part thereof, then it is said, that they haue North Latitude, and if vnto the South part, then they haue South Latitude: and also by this Circle called the line Ecliptick, is knowne the Eclipse of the Sunne and the Moone.

10. What the Articke polar circle is, being a parallel circle.

The Articke polar Circle, is made by the pole of the Zodiacke, or pole of the circle Ecliptick 23. degrees and a halfe distant from the poles of the world.

11. What the Antarticke Polar circle is, being a Parallel circle.

The Antarticke Polar circle, is iust opposite vnto the Articke Polar, made by the Antarticke pole.

12. VVhat the two circles called Colures be, &c.

The two Circles called Colures, be those that doe diuide the Zodiacke, and all the other parallel circles, into foure equall parts, the one of the circles doth crosse the Zodiacke in the first point of Aries and Libra, and so passeth by the poles of the world, and is called the equinoctiall colure: and the other Colure circle doth crosse the Zodiacke in the first point of Cancer and Capricorne, and so passeth the

two Poles of the world, and at the two Poles the one circle doth crosse the other: and that is called the Solstitiall Colure.

The vse of these two circles.

The vse of the two Colure circles is this; the sunne passing by them, doth dinde the yeere into foure parts in this manner, the Sunne in the first point of Aries is Spring-time, &c.

13. VVhat the two Poles of the world are.

The two Poles of the world, (that is to say, the North Pole called the Pole Articke, & the South Pole called the Pole Antarticke, are two poynts in the heauens, whereof the one is directly against the other, at the ends of the Axletree of the world: the North Pole is alwaies aboue our Horizon, and the South Pole Antarticke alwaies vnder our Horizon, and the Equinoctiall iust and equally betweene them: from these two Poles there must be vnderstood a right line to be drawen, which is called the Axletree of the world, about the which the whole Heauens, and all the lights of the Firmament be carried round from the East vnto the West in xxiiij houres: so that no light nor place in the heauen remaineth vnremoued, but onely the two Poles of the world, and the said Axletree.

The vse of the Poles of the world.

The vse of the two Poles is this, to know how farre wee doe transport our selues, and to know what Climate and temperatenesse we be in, as touching heat and cold.

14. VVhat the two Poles of the Zodiacke are.

The two Poles of the Zodiacke or Ecliptick, imagined to be at the end of the Axletree of the Zodiacke or Ecliptick, are the Articke pole of the Zodiacke, or rather the Ecliptick,

ticke, and the Antartick pole of the Zodiacke, the one being directly against the other, and the Zodiacke or the Ecliptick, to be iust or equall betweene them.

15. VVhat the Zenith or verticall point is.

The Zenith or verticall point, is imagined to be a pricke in the heauens right ouer the crowne of your head, and is moueable as we our selues be, and is the Pole of the Horizon circle: and as you do transport your selfe from one place vnto another, so doth your Zenith or verticall point, and your Horizon circle also change.

The vse of the Zenith or verticall point, &c.

The vse of the Zenith or verticall point is this, to know how neere or how farre off any star is from your Zenith, by taking the true height of any Starre with an instrument, for that from your Zenith is alwaies 90. degrees downe vnto the Horizon on euery side round about you, as it shall more plainely appeare hereafter, where I speake of degrees.

16. VVhat a degree is.

A degree, is the part or diuision of a whole circle diuided into 360. equall parts, how big or small soeuer the circle be.

The vse of the degree is manifold.

The vse of the degrees, is to know by the Sunne and Mones course in the Zodiacke, or any other of the Planets or moueable Starres, how many degrees they be asunder: whereby is knowne at what time they haue any aspect the one with the other. And also by the degrees it is knowen what latitude & what declination any light or starre hath frō the Ecliptick or Equinoctiall: & also the degrees will shew vnto you how many miles that you doe transport your selfe

vpon the earth to the South or North parts, for that euery degree doth answere vnto 60. English miles, in the going South and North: which is knowne by the altitude of the North Pole, or the number of degrees betweene the Equinoctiall and your Zenith or verticall point, for from your Zenith vnto the Horizon, is 90. degrees to the Southwards and 90. degrees vnto the Northwards, which is halfe the compasse of the heauens, for twise 90. is 180. and then the earth doth hide the other halfe of the heauens: and twise 180. maketh 360. the whole content of the compasse of euery great Circle in the heauens.

17. What a minute is.

Of minutes there be two sorts, minutes of time, and minutes of measure, and is no other thing but the 60. part of a degree, or the 60. part of an houre: and all the diuisions in these matters are by 60. For as 60. minutes is a degree, or an houre, so 60. seconds is a minute, and 60. thirds is a second, and 60. fourths is a third, &c.

18. Altitude or height, and the vse thereof.

Altitude or the height of any thing taken (as the height of the Sunne or any Starre, or the height of the Pole aboue the Horizon, or the height of a steeple, or tower, or such other like,) is the length of the right line contained betweene the center of the Sunne or Starre, or betweene the top of any thing whose height we desire to know and the Horizon, limited and expressed by the degrees or parts of that instrument whereby we take the said height.

19. Latitude is wideneſſe: the vse thereof.

Latitude is in the heauens: if the Moone or any other Starre be vnto the South parts, or the North parts of the Ecliptick, that then it is said to be so many degrees in Latitude or wideneſſe, from the line Ecliptick to the South or North part: and also Latitude is counted vpon the

the earth in like manner, if that you be in any place betweene the Equinoctiall and any of the two Poles, and it is expressed by the degrees of the Meridian contained betweene the Equinoctiall and the Zenith, or verticall point of the place wherein you are, either to the South or North part, &c.

20. Longitude is length: the vse thereof.

Longitude in the heauens is, the portion of the Ecliptick, contained betweene the head of Aries, and that great circle which is drawne from the Poles of the Ecliptick through the center of the Sunne or any other Starre whatsoeuer, down vnto the Ecliptick, the which Longitude is expressed either by the number of degrees contained in the said portiõ of the Ecliptick, or else by the signe and the particular degrees of that signe, vpon which the foresaid great circle drawne from the Poles of the Ecliptick doth light. As for example, if the portion of the Ecliptick contained betweene the head of Aries, and that great circle which is drawn from the Poles of the Ecliptick through the center of any Starre, vnto the Ecliptick, do comprehend 100. 200. or 300, &c. degrees, then is the Longitude of that Starre said to bee so much, or otherwise if the said great circle light vpon any Signe, as vpon Taurus or Gemini, then is the Starre said to haue his Longitude in Taurus, &c. And also Longitude vpon the earth, is counted from the Canarie Ilands vnto the Eastward, and it is that portion of the Equinoctiall which is contained betweene the Meridian of the Canarie Ilands, and the Meridian of the place assigned. This Longitude is denominated and expressed by the degrees of the Equinoctiall contained betweene the two foresaid Meridians, so that if betweene the said Meridians there bee contained 20. 30. 40, &c. degrees, then is the assigned place said to be so much in Longitude, whereby is knowne the time of the changes of the Moone, or any other aspect, or any Eclipse of the Sunne or Moone at the City or towne.

21. De-

21. Declination is leaning: the vse thereof.

Declination is counted in the heauens, if that the Sunne or any other starre be vnto the North part or South part of the Equinoctiall; and it is designed or expressed by the degrees of the great circle drawn from the Poles of the world through the center of the Sunne or starre, contained betweene the Equinoctiall and the center of the Sunne or starre propounded, whereby it is said, that the Sunne or starre hath so many degrees of declination to the South, or to the North parts as it happeneth, &c.

22 A Circumference is the line which incloseth a circle by the outer edge.

23 Diameter is the bredth of a circle, passing right ouer the center or middle thereof, from outside vnto outside.

24 Center is the middle pricke in any circle, equally distant from the edge of the circle in euery place.

25 Parallel lines or circles are, two lines or more, (how many soeuer there be) equally distant in euery place alike.

24. Auge, what it is.

Auge is a point in the heauens, when the sunne or moone is eccentricke, going neerer vnto the Heauens, and further from the earth, then her common order is: and the opposition thereof is, when that the sunne and Moone doe come nearer vnto the earth, then they doe at any other time.

The vse thereof.

The vse thereof is, to know when that they be in their swift motion, or in their slow motion: for the sunne and moone being in the Auge, moueth slower then in the opposite of the Auge.

27. Eccentricitie, what it is.

Eccentricitie is the distance betweene the center of the eccentricke circle of any Planet, and the center of the world.

28. What the head or taile of the Dragon is.

The head of the Dragon, is the place where that the Moone or any other Planet doth come ouer the line Eclipticke from the South part vnto the North part: and the taile of the Dragon is, where the Moone or any other Planet passeth ouer the line Eclipticke, from the North part, vnto the South part.

The vse of the head and taile of the Dragon.

The vse of the head and the taile of the Dragon, is to know, when that there is any Eclipse of the Sunne or Moone; and of what quantity or greatnes the Eclipse is.

29. Paralax, what it is.

Paralax is the portion of the heauen contained betweene two right lines, whereof the one is drawn from the center of the world, the other from the surface of the earth, through the center of the Moone or some other Planet, vnto the Primum mobile. Addition.

The vse thereof.

The vse of the Paralax is manifold, for that it sheweth where and in what countries that the sunne is eclipsed, as in some places the sunne may bee all wholly Eclipsed, and in some place halfe Eclipsed, and in some parts of the earth nothing Eclipsed at all, and yet the sunne and the moone both aboue the Horizon, which reason is before shewed. And also the vse of the Paralax is, if that you do

see

see any extraordinary light in the heauens, as Comets or blazing starres, by their Paralar their distance is knowne what they are from the earth, and by their distance their Diameter being taken, then the magnitude of the body is knowne, therefore there being great things to be known by the obseruation of the Paralar.

30. What Nauigation is.

Nauigation is an Art teaching how to direct our course in the Sea, to any place assigned, & by what direction, what things may stand with him, and what things may stand against him, hauing consideration how to preserue the Ship in all stormes and changes of weather that may happen by the way, to bring the Ship safe vnto the port assigned, and in the shortest time.

The Vse of Nauigation.

The vse thereof is this, first to know how that the place doth beare from him, by what winde or point of the compasse, and also how farre that the place is from him, and also to consider the streame, or tide-gates and Currents, which way that they doe set or driue the Ship, and also to consider what dangers are by the way, as Rocks and Sands, & such other like impediments, and also if that the winde change or shift by the way, to consider which way to stand, and direct his course vnto the most aduantage, to attaine vnto the port in shortest time: and also if any stormes doe happen by the way, to consider how for to preserue the Ship and the goods, and to bring her safe vnto the port assigned. And also it is most principally to bee considered and foreseene, that if they haue hap by occasion of a contrary tempest, for to goe very much out of the course or way, to know how the place doth then beare, that is to say, by what point of the compasse the place doth stand from you: and also how farre it may be

from

from you. Which way to be knowne, is this: First, to consider by what point that the Ship hath made her way by, & how fast or slowly that the Ship hath gone, and to consider how often that the Ship hath altered her course, and how much that she hath gone at euery time, and then to consider all this in your Plat or Card; and so you may giue a neare gesse, by what point or winde it beareth from you, and also how farre it is thither. And also you may haue a great helpe by the Sunne or Starres, to take the height of the Pole aboue the Horizon, and also in some place you may gesse by the sounding, both by the depth, and also by the ground. And also it is very meete and necessary to know any place when that he doth see it.

31. Of Instruments to vse at the Sea, for to take the height of the Sunne, or any Starres.

The originall of the making of all Instruments to take the height of the Sunne or any Starre, is either a circle, or the part of a circle, whose diuision is into 360. parts, what forme soeuer that it hath, as your crosse staffe it is marked according vnto the proportion of a circle: and euery one of the degrees is the equall part of a circle: namely, the three hundred and sixtie part, &c.

The vse of the Instruments.

The vse of the Instruments, as Astrolabes, or common rings, or the crosse staffe, is to take the height of the Sunne or other Starres, whose vses doe follow hereafter in the booke.

32. What manner of persons be meetest to take charge of Ships in Nauigation.

As touching those persons that are meete to take charge, that is to say, to be as a Master of ships in Nauigation, he ought

ought to be sober and wise, and not to be light or rash headed, nor to be too funnish or hasty, but such a one as can well gouerne himselfe, or else it is not possible for him to gouerne his company well: he ought not to be too simple, but he must be such a one as must keepe his company in awe of him (by discretion) doing his company no iniury or wrong: but to let them haue that which men ought to haue, & then to see vnto them, that they doe their labour as men ought to doe, in all points. And the principall point in gouernment is, to cause himselfe both to be feared, and loued, and that groweth principally by this meanes, to cherish men in well doing, and those men that be honestly adicted, to let them haue reasonable preheminence, so that it bee not hurtfull vnto the Merchant, nor to himselfe; & to punish those that be malefactors and disturbers of their company, and for small faults to giue them gentle admonition to amend them: and principally these two points are to be foreseene by the masters, (that is) to serue God himselfe, and to see that all the whole company doe so in like maner at such conuenient time as it is meet to be done. The second point is, that the Master vse no play at the dice or cards: neither (as neere as he can) to suffer any, for the sufferance thereof may doe very much hurt, in diuers respects: and furthermore, the maister ought to be such a one, as doth knowe the Mones course, whereby he doth knowe at what time it is a full sea, or a low water, knowing in what quarter or part of the skie, that the Mone doth make a full sea at that place; and also the maister ought to be acquainted, or know that place well, that he doth take charge to goe vnto (except that he hath a Pilot.) And also hee that taketh charge vpon him, ought to be expert how the tide-gates or currents, doe set from place vnto place: and also not to bee ignorant of such daungers as lye by the way, as rocks, sands, or banckes; and also most principally, he ought to be such a one as can very well direct his courses vnto any place assigned, and to haue capacitie how for to handle or shift himselfe in foule weather or stormes. And also it behoueth

neth him to be a good coaster, that is to say, to knowe euery place by the sight thereof. And also he that taketh charge for long voyages, ought to haue knowledge in Plats or Cards, and also in such instruments, as be meete to take the height of the Sunne or any Starre, and to haue capacitie to correct those instruments; & also he ought to be such a one, that can calculate the Sunnes declination, or else to haue some true regiment, and also hee ought to knowe how to handle the Sunnes declination, when that he hath taken the height of the Sunne.

Now beginneth the Regiment for the Sea, the first Chapter of Nauigation, and sheweth what the 32. points of the Compasse are, and to what vse they doe serue.

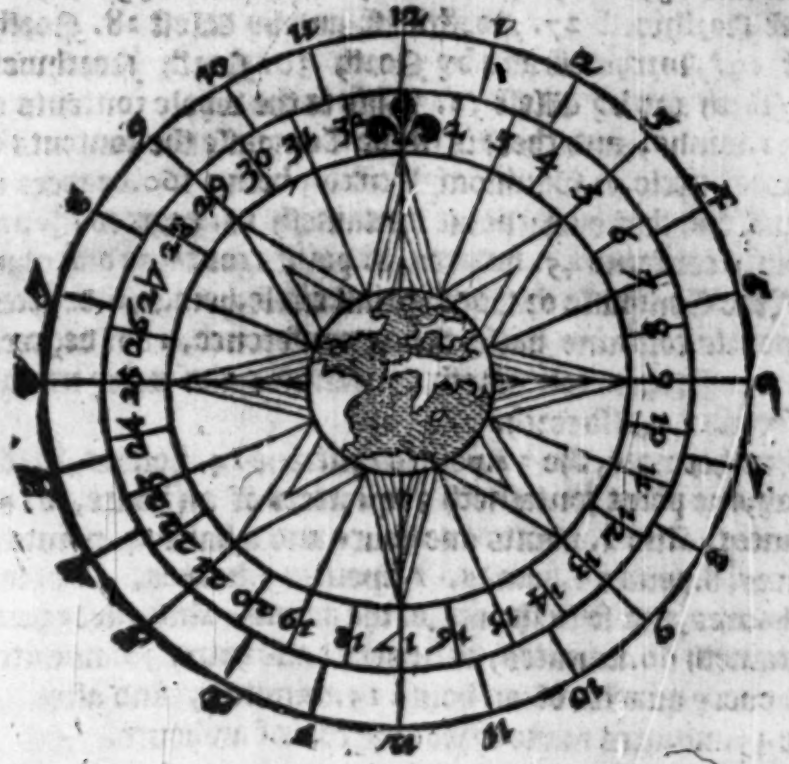
THE first any most principall thing for any seafaring man, or trauailer, is to knowe toward what part of the earth he meaneth to goe, & then being vpon the sea, where he seeth no path nor mark to trauaile by, he ought to be expert in the vse of the Needle or Compasse. Wherein this is to be noted: There be eight Capitall or head winds or points, whereof foure of them are called Cardinals, and haue their names properly of themselues; and the other foure of them, are deriued or take their names of the other foure, as thus: South & North are in the opposite points of the intersection of the Horizon and Meridian, and East is in the intersection of the Equinoctiall and the Horizon, towards the Sun rising, and West is right against it. North-east is in the midway betweene the East and the North, & South-east in the midway betweene the East and the South, and South-west betweene the West & the South, & North-west is in ỹ middle betweene the North & the West. Moreouer, there be 8. inferior points or windes, halfe way betweene euery one of those eight capitall or head points or windes, and those haue the names of

8 Capitall or head points.

8. Inferiot points or winds.

of the two points that he standeth betweene, as that point that standeth betweene the North and the North-east: is called North North-east, and that point betweene the East and the Northeast, is called East Northeast, and also that point that is betweene the East and the Southeast, is called East Southeast. And so forth vnto the rest of the eight points, whose names doe follow, as South Southeast, and South Southwest, and West Southwest, & West North-west, and North Northwest: and now betweene euery one of these inferiour points, and euery one of the head winds, there is a by-point or wind; and hee is called a by-point, for that hee is not named but by the name of one of the head points next adioyning. There be 16. of them in number, so that there be eight capitall or head points, and eight inferior points, and 16. by points or winds, so that in all there be 32. of them. The vse of these points is, to direct the Ship to what quarter of the world you doe assigne, to keepe that course, to find the place so assigned, for that the propertie of the Needle or Flie, is alwayes to stand due South and North.

As



AS touching Nauigation, for the instructions of the meanest, I haue set this figure or Compasse, where first is to be noted the 32. winds and points of the Compasse aboue made. The Flouredeluce is the first point; and there be the names beginning at the North, and so with the course of the Sunne, according vnto the common order that Seamen doe teach or instruct their youth, which is this: North 1. North and by East 2. North Northeast 3. Northeast and by North 4. Northeast 5. Northeast & by East 6. East Northeast 7. East and by North 8. East 9. East and by South 10. East Southeast 11. Southeast and by East 12. Southeast 13. Southeast & by South 14. South Southeast 15. South and by East 16. South 17. South and by West 18. South Southwest 19. Southwest and by South 20. Southwest 21. Southwest and by West 22. West Southwest 23.

The names of the 32. points of the compas.

West and by South 24. West. 25. West and by North 26. West Northwest 27. Northwest and by West 28. Northwest 29. Northwest and by North 30. North Northwest 31. North and by West 32. This is the whole contents of the 32. winds, and there is in the Compasse the contents of the great circle, or Equinoctiall circle, being 360. degrees in compasse, so that euery point containeth 11. degrees, ¼. and 4. points containe 45. degrees, 8. points containe one quarter of the Compasse or Equinoctiall circle, being 90. degrees, 26. points containe halfe the circumference, 180. degrees, and euery degree containeth 60. minutes, and euery minute 60. seconds, and so forth.

The contents of the Equinoctiall circle 360. degrees, one point of the Compasse containeth 11. degrees and a quarter.

Furthermore, the 32. points containe 24. houres, that is to say, one point containeth 3. quarters of an houre, or 45. minutes. And 2. points one houre and a halfe. 4. points 3. houres, 8. points 6. houres, 12. points 9. houres, 16. points 12. houres, and so to the rest of the points. And euery houre containeth 60. minutes, and euery halfe houre 30. minutes, and euery quarter of an houre 15. minutes, and after that rate 45. minutes make three quarters of an houre.

The 32. points brought into 24. houres.

The second Chapter treateth of the Golden number or Prime, shewing the Epact, and by the Epact, to know the age of the Moone.

IT is necessary and conuenient for the seafaring men, to know the Prime or Golden number: for by the Golden number is knowen the Epact, and the Epact sheweth the age of the Moone or change day, within twelue houres vnder or ouer: and by the age of the Moone, you may know at what a clocke it doth flow, in any place that you doe know what Moone doth make a full sea: therefore it is méete to know the Epact, and that is knowen by the Prime, or golden number. The cause why it was called the golden number, was because it was sent out of Egypt in letters of gold, to the Romanes.

The cause why that it is called the Prime, was for that it was the first order that the Moones course was knowen by, and it is thus knowen. Adde one to the yeere of our Lord wherof you would know the golden number or Prime, then diuide the number by 19. the remainder is the Prime: and multiplie that by 11. and loke what the number commeth vnto, diuide that by 30. the remainder is the Epact. Then when you haue once the Epact, adde 11. to your Epact for euery yeere more, and loke what that commeth to, that is your Epact: and if it do passe 30. put that away, and keepe the remainder for your Epact. And thus this rule will serue for euer, sauing when the Prime beginneth at one, for then the Epact is 11. and then do (as aforesaid) as you may perceiue by this Table heere following.

The cause why that is called the Prime, or golden number.

To know how many the Epact is.

¶ The Table of Prime and Epact

for xix. yeares, and when those xix. yeares be ended
then begin againe, and so it will serue
for euer, &c.

The yeere of the Lord	Prime	Epact	The yere of the Lord	Prime	Epact
1620	6	6	1630	16	26
1621	7	17	1631	17	7
1622	8	28	1632	81	18
1623	9	9	1633	19	29
1624	10	20	1634	1	11
1625	11	1	1635	2	22
1626	12	12	1636	3	3
1627	13	23	1637	4	14
1628	14	4	1638	5	25
1629	15	15			

The Prime is the time of xix. yeeres.

THe Prime or golden number, is the time of 19. yéres, in the which time the Mone maketh all her chaunges or coniunctions with the Sunne, and when these ninteene yéres be expired, then she beginneth againe: as for example. In the yére of our Lord 1619. she changed the 16. day of March, and euery yére doth alter 11. daies of her chaunge, till the yére 1638, and then shee changeth the said twentie fire day of March againe, as I shewed you before: the Epact is the putting to 11. for euery yeere. Now furthermore to know the age of the Mone, do thus; take the number of the Epact for your yére (beginning at March alwaies) and reckon how many moneths it is from March (counting March for one,) then reckon how many daies of the moneth it is, in which you would know the age of the Mone: then put

put all your number together, (that is to say, your Epact, your moneth from March, and euery day of the moneth) then looke how many it amounteth vnto, that is the age of the moone, if the number added doth not exceed 30. but if it passe 30. through all the 30. away, the remainder sheweth the age of the moone, for when the age of the moone is iust 30. then is it the change day. This is to be vnderstood concerning those months which haue 31. daies, for in them that haue only 30. daies, the coniunction is at the 29. day, & they which passe 29. are the age of the moone: Item vnto February, we must giue 29. dayes, though ordinarily that moneth hath but 28. dayes, & if it be the fifteenth day of the age of the moone, then the moone is at the full. When the age is betweene seuen dayes & eight, then is the first quarter. And if it be 22. dayes old, then the moone is at the last quarter: The rule is manifest in this example, this yeere 1620. I loke and find the Epact 6. I would know the age of the moone the 18. day of June. I recken how many moneths it is from March, reckening March for one, and I find it is 4. months: then I take and adde all these together, that is to say, 6. for the Epact, and foure for the months (that is to say, March, Aprill, May, Iune;) and then 18. for the day of the moneth, and all commeth to 28. So that you may conclude, that the moone is 28. dayes olde, and changed 28. dayes before.

To know the age of the Moon, by the number of the Epact.

The third Chapter treateth how to know by the age of the Moone, what houre it doth flow, or is full Sea at any place, where you doe know what Moone maketh a full Sea.

NOw by the age of the Moone you may knowe at what houre it is a full sea, in any place where you doe know what Moone maketh a full Sea, which rule commonly the seamen call, the shifting their sunne and moone; and many waies there be to doe it, for thus they may doe it: let them

To know the alteration of the Tides in 24. houres. An example: for the full sea vpon the lands end for euery day of the age of the Moone.

diuide one houre into fiue parts, and then take four of those parts, and put the first part away, that serueth for the alteration of the Moones course in 24. houres, and the foure fift parts of an houre are 48. minutes, and the fift part of an houre is 12. minutes. A flood and an ebbe doth alter 24. minutes forwards: as thus for example: it floweth at 12. of the clocke at the lands end vpon the change day, the Moone being in the South, at all times a full sea. The Moon being one day old, it floweth 12. of the clocke, 48. minutes: two dayes olde, it floweth at one of the clocke, 36. minutes: three dayes olde, it floweth 2. of the clocke, 12. minutes: 4. dayes olde, it floweth 3. of the clocke, 24. minutes: fiue dayes olde, it floweth 4. of the clocke iust. 6. dayes olde, it floweth 4. of the clocke, 48. minutes: seauen dayes olde, fiue of the clocke, 36. minutes: eight dayes old. 6. of the clocke, 24. minutes: 9. daies olde, seauen of the clocke, 12. minutes: ten dayes olde, it floweth 8. of the clocke iust: 11. dayes olde, 8. of the clocke, 48. minutes: 12. dayes 9. of the clocke, 36. minutes. 13. dayes old, 10. of the clocke, 24. minutes: 14. dayes old, it floweth 11. of the clocke, 12. minutes. 15. dayes old, it floweth 12. of the clocke iust, then begin the full Moone: and so begin againe as you did before at one day olde, and so forth. For to finde the course of the tides is nothing else but to adde for euery day of the age of the Moone 48. minutes: and by this account you may at all times know at what a clocke it doth flow, by putting to euery flood and ebbe 24. minutes, and to 2. floods, & 2. ebbes putting to 48. minutes.

To shift the Sunne and the Moone by the points of the Compasse.

Now furthermore, the sea-men vse to make their account by this meanes (but it is all one) they doe allow for euerie day of the age of the Moone, one point and three minutes: for a point of the compasse contayneth 45. minutes, that is 3. quarters of an houre. Then they put three minutes to 45. minutes, which make 48. minutes, the said 3. minutes is the 15. part of a point, & from the chaunge to the full is 15. daies, so that (the halfe compasse being 16 points) they breake the odde point into 15. parts, & that commeth to 3. minutes,

so

so that the alteration of the tides, for euery 24. houres bee 48. minutes, or 4. fifth parts of an houre. Wherefore there shall follow a table of tides, about certaine places of this realme: for euery moone containeth 29. dayes, 12. houres, 44. minutes from change to change: the whole contents of the houres of the moone, bee 708. houres, and 44. minutes. And there are in euery yeere 12. changes of the moone: and the yeere containeth 365. daies, 5. houres, 55. minutes, 26. seconds. Yet some doe affirme to be odde sixe houres, but there lacketh 4. minutes, 47. seconds in the Tropicall yeere. Likewise in the yeere be 12. moneths agreeable to the 12. Moones: the 12. moones containe but 354. daies, so that there be 11. daies more in the yeere, than there be in the 12. moones. The yeere also is diuided into 12. moneths, which moneths haue taken their names at the will & pleasure of men: as first January was so called of Ianus, who had two faces: for the moneth of January beholdeth the end of the yeere past, and the beginning of the yeer to come. February tooke his name of certaine Romane sacrifices, called Februa. March is so called of Mars, for Romulus so named it, after the name of his father. Aprill comes of Aperio, because that then the earth is opened. May, of Maia, the mother of Mercurie. June so called by preparing the young men to the warre. July, of Iulius Cæsar: And August, of Augustus Cæsar, for in that moneth hee entred the Consulship: then the rest of the moneths tooke their names of their number from March. Now in these 12. moneths, which make the yeere, the Sunne doth passe or goe through the Zodiacke called the 12. Signes, which is the occasion of the yeere: for this is to be noted, that the Sunne, as I said before, doth goe by his naturall mouing in 365. dayes, 5. houres, 55. minutes, 26. seconds, through the Zodiacke, containing 360. degrees, his course being from ỹ West into the East, against the course of Primum mobile, or first mouer, being moued by the mighty prouidence of God; which maketh the 24. houres: and so doth all the 7.

The contents of the number of daies and houres in one moone, the houres in euerie moone bee 708. 44. minutes.

The content of a yeere is 365. daies, 5. houres 55. minutes.

How the moneths tooke their names.

The Zodiacke containeth 360 degrees.

The mouing of 24. houres.

lights or Planets, except that it be in their retrogradation: but the Sunne and Moone bee neuer retrograde, as the other fiue Planets or lights be. And this is to be noted, that the Moone goeth faster then the Sun, for she goeth through the whole Zodiacke in twenty seuen daies & eight houres. Now in that same time the Sunne is remoued by his naturall mooning from that place of the Zodiacke neere twenty seauen degrees: and then because that the Moone hath not found the Sunne there, it is two daies, foure houres, and four and forty minutes more, before that the Moone ouertaketh the Sunne againe; so by that meanes, it is is 29. daies, twelue houres, and foure and forty minutes betweene the change of the Moone, and the next change, throughout the yeere, although that the Moone may change sometime in lesse time, & sometime in longer time, that is by the meanes of the three motions of the Moone, that is to say, her swift motion, and her meane motion, and her slow motion, which groweth by the meanes of the Moones Auge or opposition thereof. The Moone being in Auge goeth but little more then 12. degrees in 24. houres. And in the opposition of Auge neere 15. degrees in 24. houres, and in her meane or equall motion 13. degrees, 12. minutes. So this is the occasion why sometime the Moone may change sooner, or be detracted longer then the time of 29. dayes, 12. houres, and 44. minuts. This point of Auge is moueable, and doth passe throughout the Zodiacke in the time of 19. yeers: and it causeth sometime the full of the Moone to happen sooner and later. In like manner also the quarters of the Moone with all the other aspects that the Moone hath with the Sunne, or any other of the Planets, according to the Moones motion: In like manner (by the meanes of the three motions of the Moone) sometime the Moone goeth more then one point and 3. minutes in 24. houres, and sometimes lesse then one point and 3. minutes, as this for example: the Moone being in her slow motion, goeth but little more then 12. degrees in 24. houres, yea and sometimes lesse, and then the Sunne in that

The time that the Moone goeth thorow the 12. signes.

The three motions of the Moone. Of Auge.

The cause why the Moone changeth rather or later.

The Moon goeth in 24 hours somtimes more degrees, and sometime fewer degrees.

that time doth goe one degree: and then is there but 11. degrees betweene the Sunne and the Moone, (that is but 44. minutes.) So that the Moone is not one point in 24. houres from the Sunne. But being in her swift motion shee goeth neere 15. degrees in 24. houres, and the Sunne goeth one degree in that time; so that there is 14. degrees in 24. houres betweene the Moone and the Sunne, (that is 56. minutes) which is a point, and 11. minutes. Wherefore I do thinke it very necessary for to shew somewhat of the Moones motion, that they may know when that the Moone is eyther in her swift motion or her slow motion, for that I doe know that there is not in respect, any sea man that doth know it, because commonly they haue not Sea-men that haue any sight or knowledge in the Moons Theorickes: therefore let them note these few words following.

The Moone is not one point asunder from the Sunne in 24 houres.

Additions.

Seeke out in the Ephemerides the name of the moneth wherein you would know the swiftnesse or slownesse of the Moones course. In the vttermost columne answering to that Moneth towards the right hand, you shall finde the words Apog: and Perige: whereof the first signifieth the Auge of the Moone, the other signifieth the opposition of the Auge.

The day of the moneth which standeth against the word Apog: is it whereon the mone is slowest; the other against which the word Perige doth stand, is it wherein the Moone is swiftest. The which thing you may easily proone true in this maner. Right against the word Apog: seek out the place of the Moone toward your left hand vnder the Character of the Moone; subduct that out of the nert number following (by putting thirtie degrees vnto that which followeth, if neede so require) and note the remainder. In like manner against the word Perige: seeke out the place of the Moone, and subduct it out of the nert number following, compare this remainder with the former, and you shall alwaies find it to bee the greater, whereby you may conclude the Moone then to be in her swiftest motion. The like may be wrought

by

by any common Almanackes by ſubducting the degrees which the Moone poſſeſſeth the firſt day of the moneth out of the degrees which ſhe poſſeſſeth the ſecond, and ſo conſequently going on from the ſecond to the third, foureteene times together, vntill you finde the greateſt or the leaſt remainder. Where you finde the greateſt remainder in that ſigne, and on that day the Moone is in her ſwifteſt motion, and in the oppoſition of her Auge, and 14. daies after ſhee will bee in her ſloweſt motion, in her Auge: but where you finde the leaſt remainder, there the Moone is ſloweſt, and 14. daies after ſhe will bee in her ſwifteſt motion: This rule is infallible, and therefore is to bee followed rather then that which being grounded vpon the Prune, is moſt vncertaine. It is moſt neceſſary for ſea-men to know this ſwiftneſſe or ſlowneſſe of the Moone in diuers reſpects, for if that the moone bee in her ſwift motion, then it cauſeth the change, quarter, or full of the moone to be the rather. But contrariwiſe, when that the moone commeth from her ſlow motion, then that doth detract the time the longer before the Moone doth change, or is at the full, or any other aſpect.

And thus much I haue ſaid of the Moones motion: for that ſome ſea-men will take vpon them to correct the Almanackes as touching the change and quarters of the moone; holding this opinion, that euery moone ought to be equall in the number of the daies and houres: and the full moone to be iuſt the halfe contents. And the quarters in like manner, the iuſt fourth part in daies and houres, ſo that ſome of them will take vpon them to tell (by the rule of the Epact,) the true houre of the chaunge, quarters, and full of the moone: Wherein they are notably deceiued.

Error of Mariners.

Againe, ſometime in the yeere you ſhall ſee the moone rather then at ſome other time, as this for example.

From January to June, you ſhall ſee the moone within foure and twenty houres after the change, becauſe ſhee hath

North

North declination of the Sunne, and maketh a bigger Arch then the Sunne.

From July to December, you shall not see the Moone three dayes after the change, because her declination is to the South part of the Sunne: but you may see her in foure and twentie houres before her change. Now the seamen doe imagine a Prime day, which is the halfe quarter of the moone: that is, when the moone is three daies and eighteene houres old, (the moone being then foure points to the Eastward of the Sunne, which is three houres:) the same rule may they in like case observe when the moone is past the full three dayes and eighteene houres, and also in the middes of the quarters.

Heere followeth a Table of Tides.

FIrst, the Moone South or North, on Lands end full Sea.

The Moone South and by East, at the Goze ende full Sea.

The moone South Southwest, betweene holy Iland and Tinemouth, full sea.

It floweth betweene Tinemouth and Flamborough head, Southwest and Northeast moone.

It floweth betweene Flamborough head, and Bridlington in the Bay, a southwest and by west moone.

The moone in the west southwest, betweene Bridlington and Laurenas, full sea.

It floweth betweene Laurenas and Cromer all along the well: an East and West moone.

It floweth betweene Cromer and Yarmouth Rode, to Laystow North Rode, a southeast moone.

It floweth betweene Laystow Rode and Orfordenas, a southeast and by south moone.

It floweth betweene Orford and Orewel waues, a south southeast moone.

It

It floweth betweene the Nas and the Ware head of Colne, a south and by East moone.

It floweth at the Spittes, and at the Sheue, and all alongst the Swinne, a south moone.

At the West end of the Noze, a south and by west moone, full sea.

It floweth at Grauesend, a south southwest moone.

It floweth at London bridge, a southwest moone.

It floweth at the North Foreland, a south southeast moone, and so alongst the coast till you come to Bechey. And in the Offing from the the north Foreland to the south Foreland, it runneth halfe tide. And from the south Foreland to the Nas, the tide runneth halfe tide halfe quarter. And from the Nas to Fairely, it runneth halfe tide: and from Fairely to Beche, it runneth quarter tide vnder other.

It floweth to the Westward of Beche, a kenning, a southeast and by south moone.

It floweth at Portesmouth, a South and by East moone.

It floweth at S. Clens a south southeast moone.

It floweth on the sea side of the Iland, a southeast and by south moone: and so on the land, and at the Nedles, and runneth quarter tide in the Offing.

It floweth at Poole in the hauen: a southeast moone.

It floweth at Waymouth: an East and West moone.

It floweth at Portland: a southeast moone.

It floweth from the West part of Portland, till you come vnto Plimmouth, an East and West moone.

It floweth on the shore from Plimmouth to the Lezard, a west and by south moone. And in the Offing a southeast moone.

It floweth at Mounts Baye: an east and west moone.

It floweth at Selly: West and by south moone.

It floweth at the lands end of Golfe: a West southwest moone.

It floweth all alongst the coast vp to Brisstow, and the coast

coast of Ireland, from Waterford to Kinsale, & west and by south Woone.

Furthermore it floweth (for the most part) from the Wale head of Bardeaux all alongst the coast of Biskey, Galyza, Portingale, till you come to the streights of Gebiga, a south west and North east moone.

It floweth at Flushing, a southwest and by south moone.

It floweth at Antwerp, an East and West moone.

It floweth all alongst the coast of Flanders, from the Wattoings to Calys, a south and by East moone: and so runneth halfe tide vnder the other.

Now there is a speciall thing to bee noted, and that is this: It floweth one point of the Compasse more in the Spring Tides, then it doth in any of the quarters of the moone, (so that it bee a Riuer where there is any indraft, hauing distance from the sea) when there is neither rage of windes, nor any cause either to hinder or further the said effect.

It will flow a point o the compasse more in the spring-tides than in the neap.

As for example, thus: It floweth at Graueseend at the change of the Woone or full, a south southwest moone. But in any of the quarters of the Woon it scant floweth, a South and by West Woone: and this is generall for euer.

Tides in a riuer that hath any distance vnto the sea.

The fourth Chapter treateth of the Sunne and Moones course in the Zodiacke: and how you shall know what houres the Moone shall rise and set: and at what point of the Compasse, with other necessary things.

FUrthermore, the Sun (by his naturall mouing through the 12. signes in the Zodiacke in the yeere) doth cause the height & lowines of his declination: which is necessary for the sea-faring men to know, the which declinatiõ they do take from Equinoctiall to Equinoctiall. And this is to be noted, that

that as the Sunne hath declination, in like manner hath the Moon, for by her declination and the sunnes, is knowne the time of her shining or abiding aboue our Horizon.

To know how long the Moon shineth.

The Sunne or Moone in the first minute of Aries, do rise East, and set West, and shine twelue houres. In the first minute of Taurus, they rise neere the East Northeast, and set neere the West Northwest, and shine somewhat more then 14 houres. In the signe of Gemini, they rise neere the Northeast and by East, and they set neere the Northwest and by West, and shine neere fifteen houres. In the signe of Cancer, the first minute, they make their greatest declination to the Northwards, and they rise neere the Northeast, and set neere the Northwest, and shine neere 16. houres and a halfe. In the first minute of Leo, (descending towards the Equinoctiall) as they did in Gemini. And in the signe of Virgo, as they did in Taurus. And in the first minute of Libra, Equinoctiall: beginning such declination, as in Aries. And in the first minute of Scorpio, they rise neere the East southeast, and set neere the west southwest, and shine ten houres. In the first minute of Sagittarius, they rise neer the southeast and by east, and set neere the southeast & by west, and shine eight houres. In the first minute of Capricornus, they haue their greatest declination to the south, and begin to returne to the Equinoctiall, rising neere the southeast, and setting neere the southwest, and shine seauen houres and a halfe. In the first minute of Aquarius, as in Sagittarius. In the first minute of Pisces, as in Scorpio.

To know when the Sunne riseth and setteth.

By this meanes you may know the time of the sunnes rising and setting, in this manner. Diuide the time of the sunnes shining, or continuance aboue the Horizon into two equall parts: the one part sheweth the time of his setting: & it being subducted from 12. sheweth the time of his rising. As for example: Because the sunne being in Cancer, as is aforesaid, shineth 16. houres and a halfe; therefore I diuide that time into two equall parts (whereof the one is 8.

houres

houres and one quarter,) and say that the sun setteth a quarter of an houre after eight, this number being subducted from 12. declareth the sunne to arise three quarters after three in the morning.

Also by this rule you may knowe the time of the rising and setting of the Moone for euer. But before I say any more of that matter, heere is to bee noted, that when the Moone changeth, then the Sunne and shee are both in one degree of the Ecliptick, and therefore they arise at one time, and vpon one point of the Compasse, and continue aboue the Horizon both a like time. When the Moone is at the full, the sunne and shee are opposite one against the other, and sixe signes asunder, so that she ariseth at the same time when the sunne setteth, and setteth when the sunne ariseth, but vpon the contrary point of the Compasse. And if the time of the continuance of the sunne aboue the Horizon be subducted out of 24. houres, the remainder sheweth the continuance of the Moone aboue the Horizon. The quarters be when the sunne and moone are 3. signes asunder, that is 90. degrees. Moreouer from the change of the moone to the full, the moone ariseth after the sunne, and setteth after him: But from the full to the change, the Moone ariseth and setteth before the Sunne. Therefore if at these intermiddle times betweene the change and the full, and the full and the change againe, you desire to know the time of the rising and setting of the moone, note this: I haue shewed you before, speaking of the shifting of the sunne and moone, that euery day of the age of the moone, the moone goeth Eastward one point and three minutes, so that you must looke how many dayes the moone is olde, then put so many points, and so many three minutes together, and conuert them into houres: if the number bee lesser then twelue, it sheweth how long the moone ariseth after the sunne. But if the said number be more then 12. cast away twelue, and the remainder sheweth how long the moone ariseth before the sunne. The time

To know when the Moone riseth & setteth.

time of her arising being once knowen, the time of her setting is easily knowen. For as many houres as she continueth in the East aboue the Horizon before shee commeth to the South, so many houres shee continueth in the West before shee setteth vnder the Horizon after shee is past the South: as for example thus. In March alwayes the sunne is in Aries, then the Moone being in her first quarter, is fiue houres to the Eastward of the sunne, then the moone must nedes be in Cancer. Then shineth the moone in our Horizon 16. houres and a halfe, and is South at fiue of the clocke, and shineth 8. houres and a quarter after 6. of the clocke. So that she setteth at 2. of the clocke and a quarter of an houre past, and riseth in the day 8. houres and a quarter before 6. of the clocke, that is, at 9. of the clocke, and 3. quarters of an houre past. Now at the last quarter in March, then the moone must nedes be in Capricornus, and shineth but 7. houres and a halfe, and is south at 6. of the clocke in the morning, & riseth 3. houres and 3. quarters before, that is 2. of the clocke & a quarter of an houre past in the morning, and she setteth by day at 9. of the clocke, and 3. quarters of an houre past: and this rule will serue for euer, without any great errour. But yet there is a further matter for the exact doing, which is the latitude of the Moone from the head or taile of the Dragon.

Ensample of the Moones rising and setting.

The Moone hath Lattude.

And now for to shewe vnto you when that the Moone is with the head and the taile of the Dragon, as I haue in the third Chapter said vnto you, there are but few seamen that doe know the Moones Theorickes, for they cannot tell when that the Moone is in her swift or slow motion. So in like maner it is necessary for to know the Moones latitude from the line Ecliptick, & also of which side of the line Ecliptick, which is known by the head or taile of the dragon. For when that the Moone hath passed 90. degrees from the head of the Dragon, then the Moone hath latitude 5. degrees vnto the North parts of the line Ecliptick, and also if that the Moone be 90. degrees from the Dragons taile, then the Moone hath latitude 5. degrees vnto the south parts of the line Ecliptick.

So

So that the Dragons head is no other thing, but the crossing or passing of the Moone from the South parts vnto the North part of the line Ecliptick. So in like manner the Dragons taile is the crossing or passing of the Moone ouer the line Ecliptick from the North part vnto the South parts of the line Ecliptick. The effects hereof is this; if the Moone doth come with the head or taile of the Dragon at her opposition or full, then shee shall bee eclipsed, because the shadow of the earth is seene vpon the Moone, and these Eclipses be generall through the face of the whole earth, if that the Moone be aboue the Horizon. And in like maner, if that the Moone doth come with the head or taile of the Dragon at the coniunction or chaunge of the Moone, then the Sunne is eclipsed, for that the Moone commeth betweene the Sonne and the earth; but these eclipses are not generall, for that the Diameter of the earth is more then fiue times the Diameter of the Moone: and also the Moone commeth very neere vnto the earth in respect of the great distance that the Sunne is from the earth, so that the Sun may be eclipsed in one place but not in another, which doth happen by the Moones Paralar, as afore I haue shewed &c. And now for to know where the Dragons head is, note this, when that the Prime is one, then the Dragons head is in the first part of Aries, as the point of Auge is. But their motions are contrarie: For as the point of Auge is in Aries, and from thence commeth into Taurus, and so successiuely proceedeth through the 12. signes in 19. yeeres. So the Dragons head doth passe through the 12. signes in 19. yeeres backwards, for being in Aries, it commeth into Pisces, and thence into Aquarius, &c. So that in 9. yeeres & a halfe, the Dragons head is in Libra, and doth meete with the point of Auge, &c.

And now for to know the Moones Latitude, marke this; the Prime one, the Dragons head is in Aries, whereby it may be inferred that the Moone in Cancer, is 90. Degrees from the Dragons head, and hath her farthest distance from the line Ecliptick, that is, fiue degrees. So that the Moone

decline fiue degrees more vnto the Northwards that the Sunne doth, and her whole declination is 28. degrees and a halfe from the Equinoctiall, touching the Dragons taile which is alwaies opposite vnto the Dragons head, ỹ Prime being one, the Dragons taile is in Libra. Item the Moone passing Cancer, commeth nearer the Ecliptick, and in Libra she crosseth the line Ecliptick, and when she is come into Capricorne, then she is fiue degrees vnto the Southwards of the line Ecliptick, and declineth 28. degrees and a halfe vnto the Southwards of the Equinoctiall. So that the Moone doth decline inward, (medling not with the Moones Paralaxe) 57. degrees the Prime being one, in nine yeeres and a halfe, the Dragons head shall be in Libra, and the taile in Aries, & then the Moone in the signe of Libra, shall passe ouer the line Ecliptick from the South part to the North part. So that the Moone in the signe of Capricorne, is fiue degrees vnto the North of the line Ecliptick, and then shee doth decline but 18. degrees and a halfe from the Equinoctiall to the South parts, and so in the signe of Aries, the Moone shall passe ouer the line Ecliptick frō the North vnto the South, and then in Cancer the Moone is fiue degrees vnto the south of the line Ecliptick, and doth decline 18. degrees vnto the North parts of Equinoctiall, so that the Moones whole declination, is but 37 degrees. So when the Prime is one, the declination of the Moone is more by 20 degrees, then when the Prime is betweene nine and ten yeeres, and when the Prime is neere fiue, then the Dragons head is in Capricornus. And when the prime is 14. or 15. the Dragons head is in Cancer. So that in 19. yeares the Dragons head doth passe through the twelue signes backwards.

Thus by knowing what the Prime is, you may knowe where the Dragons head is, and also ỹ Dragons taile, and then that knowne, you may know the Moones latitude from the line Ecliptick, and of which side: For when the Moone is in the Dragons head, then she passeth ouer from the south vnto the north part, but when she is with the Dragons taile

then she passeth ouer from the North vnto the South part of the line Eclipticke, and then when that the Moone is halfe way betweene the head and the taile of the Dragon, then is she fiue degrées in Latitude from the line Eclipticke, that is to say, if that shee come from the head of the Dragon, shee is fiue degrées on the North side, if from the taile, then is she fiue degrées on the South side, of the line Eclipticke: and this I doe thinke sufficient for instruction. Heere (as before) I could wish that Seafaring men or others, would not leane too much vnto these rules of the Prime concerning the finding out of the true place of the Dragons head or tayle, because they are vncertaine, but I would wish them to sticke vnto the Ephemerides, wherein to saue their labour these things are seuerally set downe with more certaintie.

Yet there is one thing which I would Sea-faring men should cõsider, although a great nũber be expert in that, yet it is meet to be spoken of, as this. The Sunne being in Cancer, or Moone in like manner, or in Gemini, or any time when the Sunne or Moone hath North declination, they will set their Compasse before them, & when they see the Sun giue an East shadow, they will say that it is six of the clocke whereas if the Sunne be in Cancer, it is not much past fiue of the clocke, and the farther they are to the Southwards, the more they do erre. And in like case the moone being in Cancer, whe they do see the moone giue an East shadow by their cõpasse, they wil say the moone is west, but they do not consider, that the Sun & the Moone being in Cancer, commeth too neere the Zenith, or vertical point right ouer our head, (which is the very height of their declination) that the position of their shadow can hardly be discerned, therefore they must iudge the east or west frõ the pole or north star, if they wil iudg truly.

You cannot know what a clocke it is by the Compasse, the Sun being in the North signes.

Errour of the shadow of the Moone.

Wherefore I do much commend the Equinoctiall dyals for the exact truth, for they cannot know the truth by their Compasse, if that the Sunne or Moone, or any other starre, haue any great declinatiõ, being in Cancer: & you must consider this in like maner. The Sun hauing North declinatiõ,

The Equinoctiall dials be very good.

the further you do go to the Northwards, the longer is your day, and the shorter is your night; and towards the Southwards the shorter daies and longer nights.

As touching the length and shortnes of the day and night.

Now contrariwise, the Sunne hauing South declination, the more to the Northwards, the shorter daies and the longer nights; the further to the Southwards, the longer daies and shorter nights; and vnder the Equinoctiall, the nights and daies al one, what declination soeuer the Sunne hath: but this rule that I haue giuen you is for London, or any other place that hath North Latitude for the eleuation of the Pole Arcticke.

¶ The fifth Chapter is of a Table of declination, commonly called of Sea-faring men, A Regiment of the Sun, exactly calculated for foure yeeres, and will serue for twenty foure yeeres, for euery day of the Moneth.

AND in like manner as I haue said somewhat of the Moones motion, so doe I thinke it conuenient for to say somewhat of the Sunnes motion, for that it is necessary for Sea men for to know the Sunnes place in the Zodiacke, whereby that they may calculate or count the Sunnes declination, truly, and (as I haue shewed before,) that the Sunne doth passe through the Zodiacke in 365. daies, fiue houres, fifty fiue minutes, 26. seconds, and hath three motions as the Moon hath. In the point of Auge is the Suns slow motions, and then the Sunne passeth or goeth but little more then fifty seuen minutes in 24. houres: and in the opposition of Auge, the Sun passeth or goeth one degree and neere two minutes in 24. houres, that is more by fiue minutes almost in his swift motion then in his slow motion. The point of Auge is now in this age of the world in the signe of Cancer, but not in the Solstitiall point, where

where that the Sun hath his greatest declination, and also the opposition of Auge is in Capricorne, but not there where the sunne hath his greatest declination. Now by the meanes of the three motions of the sunne, it falleth out that the Equinoctiall points be not euen, for that there are more daies from the Equinoctiall of March, vnto the Equinoctiall of September, by neere nine daies, then there is from the Equinoctiall of September, vnto the Equinoctiall of March, for that there is from the eleuenth day of March vnto the 14. day of September. 187. dayes, & there is but 178. dayes from the 14. day of September, vnto the 11. day of March. And the reason is this as I haue said before, because that in the latter part of June the Sunne is in his slow motion, and also in the later part of December, hee is in his swift motion: & this doe I thinke sufficient for instructions in this matter, for that the Seamen haue no farther to doe with the Sunnes motion, but onely from the true place of the Sunne to seeke the true declination of it: and also the most part of sea men haue vsed Spanish Regiments, and thinking that those would haue serued for euer, which is most contrary, for if that it be neuer so truely calculated, yet it groweth after twentie foure yeeres vnto errour.

For as often as euery yeere of Bissextilis doth come about which is euery fourth yeere, the Sunne is sooner in the Equinoctiall by more than halfe an houre, &c.

Now shall follow a Table of declination or Regiment for foure yeares, being calculated for the Longitude of 24. d. and will serue all Europe without much errour, or any other countrie or place that hath the same Longitude, as the most part of Africa, Ginnie, and those parts to the Southwards, as farre as the Antartick Pole, seruing for euery day of the moneth, very necessarie for them that do vse to trauaile either by sea or by land, & is one of the principal points in Nauigation, for long voiages; and the cause why I haue written this Regiment for the Sea, or Tables of declination, is for that I doe know that euery person that goeth vn-

Euery person cannot calculate the sunnes declination.

to the sea, as Master of a ship, hath not capacity to calculate the sunnes declination, by the place of the Sunne, although they haue the Tables of declination, as the Ephemerides, or Martine Curtise, otherwise called the Art of Nauigation. Wherefore I haue written these notes, and Regiment or Table of declination for foure yeeres, and the first rowe towards your left hand, is the dayes of the moneth: the nert row, is the degrees of declination that the sunne hath at the instant time of noon: and the third rowe is the odde minutes of declination belonging to the degrees.

Twice in the yeere the Sun hath declination. 1577.

Now there be two times in the yeere that the sunne hath no declination, as this: For the first yeere after Bissextilis, (which is in the yeere of our Lord 1617. the 10. day of March, betweene eight and nine of the clocke at night) the Sunne will be in the Equinoctiall, beginning North declination. And in like manner, the 13. day of September betweene nine and tenne of the clocke, the Sunne will bee in the Equinoctiall beginning South declination; and also the second yeere after Bissextilis, which is the yeare of our Lord 1618. the Sunne is in the Equinoctiall the 11. day of March, betweene 2. and 3. of the clocke before noone, beginning North declination, and in like manner the 13. day of September betweene 3. and 4. of the clocke in the afternoon, beginning South declination.

Furthermore, in the third yeer after Bissextilis, which is the yeere of our Lord 1619. the Sunne is in the Equinoctiall the 11. day of March, betweene 8. and 9. of the clocke in the morning, beginning North declination, and so in like manner the 13. day of September betweene nine and tenne of the clocke at night, beginning South declination.

Lastly, in the yeere of our Lord 1620. that is, the yeere Bissextilis it selfe; vpon the 10. day of March, the sunne shal bee in the Equinoctiall about 3. of the clocke after noone, beginning North declination: and in like manner the 13. day of September, betweene 3. and 4. of the clocke in the morning,

morning, beginning South declination : Now these foure yeeres beeing expired, you must begin againe at the first yeere after the yeere Bissextilis or leape yeere, as heere doth follow for example. And so it will serue for twenty yeeres to come.

Yeere 1	Yeere 2	Yeere 3	Yeere Bissextilis
1617	1618	1619	1620
1621	1622	1623	1624
1625	1626	1627	1628
1629	1630	1631	1632
1633	1634	1635	1636
1637	1638	1639	1640

To the Reader of this Regiment.



Gentle Reader, I haue painefully and truely calculated this Regiment for your vſe, and deſire you to perſwade your ſelfe ſo. If it ſhall ſeeme otherwiſe, either it ſo falleth out by means of your obſeruation, or in reſpect of the place in which you are, which may alter the place of the Sun, and conſequently his declination diuerſly. Therefore if your expectation in ſearching the eleuation of the Pole by this Regiment be not fully anſwered, let not my labour be vnaduiſedlie reproued, leſt I be diſcouraged; but let the fault remaine where it is. In my booke called the Marriners eaſe, which is ſhortly to come forth, beſides many things elſe fit for your vſe, you ſhall haue an ample Table for the Sunnes declination calculated for euery degree and minute of the Eclipticke. By the which Table you ſhall be ſufficiently and plainly inſtructed how to finde out the declination of the Sunne in any place whereſoeuer you are.

Vntill then I reſt, Yours

Thomas Hood.

1617.

The

South declination. Sun in the Equinoctial North declination.

Declination South.

Januarie.			February			March.		
D.	G.	M.	D.	G.	M.	D.	G.	M.
1	21	48	1	13	55	1	3	35
2	21	38	2	13	35	2	3	11
3	21	28	3	13	14	3	2	47
4	21	17	4	12	54	4	2	23
5	21	6	5	12	34	5	2	0
6	20	55	6	12	13	6	1	36
7	20	43	7	11	52	7	1	13
8	20	31	8	11	33	8	0	50
9	20	18	9	11	10	9	0	26
10	20	5	10	10	48	10	0	2
11	19	51	11	10	26	11	0	22
12	19	38	12	10	4	12	0	45
13	19	23	13	9	42	13	1	9
14	19	9	14	9	20	14	1	32
15	18	54	15	8	58	15	1	57
16	18	39	16	8	35	16	2	19
17	18	23	17	8	13	17	2	42
18	18	8	18	7	50	18	3	6
19	17	51	19	7	28	19	3	30
20	17	35	20	7	5	20	3	55
21	17	19	21	6	48	21	4	16
22	17	1	22	6	20	22	4	39
23	16	44	23	5	56	23	5	2
24	16	26	24	5	32	24	5	26
25	16	9	25	5	10	25	5	48
26	15	50	26	4	46	26	6	11
27	15	32	27	4	23	27	6	34
28	15	12	28	3	58	28	6	57
29	14	54				29	7	19
30	14	34				30	7	42
31	14	15				31	8	3

Aprill.				Maie.				Iune.		
D.	G.	M		D.	G.	M.		D.	G.	M
1	8	25		1	17	57		1	23	9
2	8	47		2	18	13		2	23	13
3	9	9	North.	3	18	28	North.	3	23	16
4	9	31		4	18	42		4	23	20
5	9	52		5	18	56		5	23	23
6	10	14		6	19	11		6	23	24
7	10	35		7	19	24		7	23	26
8	10	55		8	19	38		8	23	28
9	11	16		9	19	51		9	23	29
10	11	37		10	20	3		10	23	30
11	11	57		11	20	15	Solstice.	11	23	30
12	12	18		12	20	28		12	23	30
13	12	38		13	20	39		13	23	30
14	12	57		14	20	51		14	23	29
15	13	17		15	21	1		15	23	28
16	13	36		16	21	12		16	23	27
17	13	55		17	21	22		17	23	25
18	14	15	Declination.	18	21	32	Declination.	18	23	23
19	14	33		19	21	41		19	23	20
20	14	51		20	21	50		20	23	17
21	15	10		21	21	59		21	23	13
22	15	27		22	22	7		22	23	10
23	15	46		23	22	15		23	23	6
24	16	3		24	22	22		24	23	1
25	16	20		25	22	29		25	22	55
26	16	37		26	22	36		26	22	50
27	16	53		27	22	42		27	22	45
28	17	10		28	22	49		28	22	38
29	17	26		29	22	55		29	22	31
30	17	41		30	22	59		30	22	20
				31	23	0				

Iulie.				Auguſt.				Septemb.		
D.	G.	M		D.	G.	M.		D.	G.	M.
1	22	8	North.	1	15	57	North Declination.	1	4	30
2	22	0		2	15	0		2	4	10
3	21	52		3	14	41		3	3	45
4	21	44		4	14	23		4	3	22
5	21	34		5	14	4		5	3	0
6	21	24		6	13	48		6	2	35
7	21	15		7	13	25		7	2	14
8	21	4		8	13	6		8	1	50
9	20	54		9	12	47		9	1	25
10	20	43		10	12	30	Sun in the	10	1	2
11	20	31		11	12	10	Equinoctial	11	0	40
12	20	20		12	11	47		12	0	15
13	20	8		13	11	27		13	0	10
14	19	55		14	11	6		14	0	32
15	19	42		15	10	45		15	0	55
16	19	28	Declination.	16	10	25		16	1	18
17	19	15		17	10	4		17	1	42
18	19	2		18	9	42		18	2	6
19	18	48		19	9	20	South Declination.	19	2	29
20	18	32		20	9	0		20	2	52
21	18	18		21	8	37		21	3	16
22	18	4		22	8	16		22	3	38
23	17	47		23	7	53		23	4	2
24	17	32		24	7	32		24	4	26
25	17	17		25	7	10		25	4	44
26	17	0		26	6	50		26	5	12
27	16	43		27	6	26		27	5	35
28	16	27		28	6	3		28	5	58
29	16	11		29	5	40		29	6	20
30	15	53		30	5	16		30	6	45
31	15	34		31	4	53				

October				November				December		
D.	G.	M.		D.	G.	M.		D.	G.	M.
1	7	7	South.	1	17	33	South.	1	23	5
2	7	30		2	17	49		2	23	9
3	7	52		3	18	5		3	23	14
4	8	15		4	18	21		4	23	17
5	8	37		5	18	36		5	23	21
6	8	59		6	18	51		6	23	23
7	9	21		7	19	6		7	23	25
8	9	43		8	19	20		8	23	27
9	10	5		9	19	35		9	23	29
10	10	27		10	19	49		10	23	30
11	10	48		11	20	2	Solstice.	11	23	30
12	11	10		12	20	15		12	23	30
13	11	31		13	20	28		13	23	29
14	11	52		14	20	40		14	23	28
15	12	13		15	20	52		15	23	26
16	12	34		16	21	23		16	23	24
17	12	54		17	21	14		17	23	27
18	13	14		18	21	25		18	23	19
19	13	34		19	21	35		19	23	15
20	13	54		20	21	45		20	23	12
21	14	14		21	21	54		21	23	8
22	14	33		22	22	3		22	23	3
23	14	52		23	22	82		23	22	58
24	15	11		24	22	20		24	22	52
25	15	29		25	22	28		25	22	47
26	15	48		26	22	35		26	22	40
27	16	6		27	22	42		27	22	33
28	16	24		28	22	49		28	22	25
29	16	40		29	22	55		29	22	16
30	16	55		30	23	0		30	22	9
31	17	16	Declination				Declination	31	22	0

1618. The second after the Leape yeare.

Ianuarie.				Februarie				March.			
D.	G.	M.		D.	G.	M.		D.	G.	M.	
1	21	50	South.	1	14	0	South declination.	1	3	48	North declination.
2	21	40		2	13	40		2	3	18	
3	21	30		3	13	20		3	2	54	
4	21	20		4	13	0		4	2	30	
5	21	9		5	12	40		5	2	6	
6	20	58		6	12	20		6	1	43	
7	20	46		7	12	0		7	1	18	
8	20	34		8	11	36		8	1	0	
9	20	21		9	11	15		9	0	30	
10	20	8		10	10	93	Sun in the	10	0	8	
11	19	54		11	10	31	Equinoctial	11	0	16	
12	19	41		12	10	10		12	0	39	
13	19	27		13	9	48		13	1	3	
14	19	12		14	9	26		14	1	27	
15	18	58		15	9	10		15	1	50	
16	18	44	Declination	16	8	41		16	2	13	
17	18	27		17	8	18		17	2	36	
18	18	12		18	7	56		18	2	59	
19	17	56		19	7	33		19	3	24	
20	17	39		20	7	12		20	3	48	
21	17	23		21	6	48		21	4	10	
22	17	6		22	6	25		22	4	33	
23	16	50		23	6	2		23	4	56	
24	16	33		24	5	38		24	5	19	
25	16	14		25	5	15		25	5	42	
26	15	55		26	4	2		26	6	5	
27	15	36		27	4	28		27	6	28	
28	15	17		28	4	5		28	6	50	
29	15	0						29	7	13	
30	14	40						30	7	36	
31	14	20						31	7	57	

Aprill.				Maie.				Iune.		
D.	G.	M		D.	G.	M.		D.	G.	M
1	8	19	North.	1	17	54	North.	1	23	8
2	8	41		2	18	9		2	23	12
3	9	3		3	18	25		3	23	15
4	9	25		4	18	39		4	23	19
5	9	46		5	18	53		5	23	22
6	10	8		6	19	7		6	23	24
7	10	30		7	19	21		7	23	26
8	10	50		8	19	34		8	23	28
9	11	10		9	19	47		9	23	29
10	11	32		10	19	58		10	23	30
11	11	52		11	20	12	Solstice.	11	23	30
12	12	12		12	20	25		12	23	30
13	12	33		13	20	37		13	23	30
14	12	53		14	20	48		14	23	29
15	13	12		15	20	59		15	23	28
16	13	32		16	21	10		16	23	26
17	13	50		17	21	20		17	23	24
18	14	10		18	21	30		18	23	21
19	14	29	Declination.	19	21	39	Declination.	19	23	18
20	14	46		20	21	48		20	23	14
21	15	5		21	21	56		21	23	10
22	15	23		22	22	5		22	23	5
23	15	41		23	22	13		23	23	3
24	15	59		24	22	21		24	22	57
25	16	16		25	22	28		25	22	52
26	16	33		26	22	35		26	22	46
27	16	49		27	22	41		27	22	39
28	17	5		28	22	48		28	22	33
29	17	22		29	22	53		29	22	26
30	17	38		30	22	58		30	22	19
				31	23	4				

North Declination. Sun in the Equinoctial South Declination.

Iulie.			August.			Septemb.		
D.	G.	M.	D.	G.	M.	D.	G.	M.
1	22	11	1	15	25	1	4	37
2	22	3	2	15	4	2	4	14
3	21	54	3	14	46	3	3	5
4	21	45	4	14	27	4	3	28
5	21	37	5	14	9	5	3	5
6	21	27	6	13	49	6	2	42
7	21	17	7	13	30	7	2	18
8	21	7	8	13	8	8	1	56
9	20	56	9	12	52	9	1	31
10	20	45	10	12	32	10	1	9
11	20	34	11	12	12	11	0	45
12	20	23	12	11	52	12	0	21
13	20	10	13	11	35	13	0	3
14	19	58	14	11	2	14	0	26
15	19	45	15	10	49	15	01	49
16	19	32	16	10	29	16	1	12
17	19	19	17	10	8	17	1	35
18	19	5	18	9	47	18	1	59
19	18	50	19	9	26	19	2	23
20	18	36	20	9	4	20	2	47
21	18	23	21	8	42	21	3	11
22	18	6	22	8	2	22	3	34
23	17	51	23	8	0	23	3	56
24	17	36	24	7	37	24	4	20
25	17	21	25	7	15	25	4	43
26	17	5	26	6	53	26	5	7
27	16	48	27	6	30	27	5	29
28	16	31	28	6	7	28	5	52
29	16	15	29	5	45	29	6	15
30	15	57	30	5	22	30	6	39
31	15	40	31	5	0			

North. Declination.

October				November				December		
D.	G.	M.		D.	G.	M.		D.	G.	M.
1	6	59	South.	1	17	29	South.	1	23	4
2	7	25		2	17	44		2	23	8
3	7	47		3	17	59		3	23	13
4	8	9		4	18	16		4	23	16
5	8	32		5	18	33		5	23	20
6	8	53		6	18	46		6	23	23
7	9	16		7	18	59		7	23	25
8	9	38		8	19	16		8	23	27
9	9	59		9	19	30		9	23	29
10	10	22		10	19	45		10	23	30
11	10	43		11	19	58	Solstice.	11	23	30
12	10	4		12	20	12		12	23	30
13	11	26		13	20	24		13	23	30
14	11	47		14	20	36		14	23	29
15	12	8		15	20	48		15	23	27
16	12	29		16	20	59		16	23	25
17	12	50		17	21	10		17	23	23
18	13	10		18	21	22		18	23	20
19	13	30		19	21	32		19	23	17
20	13	50		20	21	42		20	23	13
21	14	10		21	21	52		21	23	9
22	14	29		22	22	0		22	23	4
23	14	48		23	22	10		23	22	59
24	15	6		24	22	18		24	22	54
25	15	25		25	22	26		25	22	48
26	15	43		26	22	33		26	22	41
27	15	59		27	22	40		27	22	34
28	16	20		28	22	47		28	22	27
29	16	38		29	22	53		29	22	20
30	16	55		30	22	58		30	22	10
31	17	12	Declination.				Declination.	31	22	0

South declination. Sun in the Equinoctial North declination.

Ianuarie.			February.			March.		
D.	G.	M.	D.	G.	M.	D.	G.	M.
1	21	52	1	14	6	1	3	47
2	21	43	2	13	45	2	3	24
3	21	34	3	13	27	3	3	0
4	21	25	4	13	5	4	2	36
5	21	12	5	12	44	5	2	12
6	21	0	6	12	24	6	1	49
7	20	49	7	12	3	7	1	25
8	20	37	8	11	42	8	1	1
9	20	24	9	11	2	9	0	38
10	20	11	10	11	0	10	0	14
11	19	88	11	10	38	11	0	30
12	19	45	12	10	16	12	0	34
13	19	30	13	9	54	13	0	57
14	19	16	14	9	32	14	1	21
15	19	2	15	9	10	15	1	44
16	18	46	16	8	48	16	2	6
17	18	31	17	8	24	17	2	31
18	18	16	18	8	2	18	2	54
19	18	0	19	7	39	19	3	18
20	17	43	20	7	17	20	3	42
21	17	27	21	6	54	21	4	4
22	17	10	22	6	31	22	4	28
23	16	52	23	6	8	23	4	50
24	16	35	24	5	44	24	5	14
25	16	18	25	5	21	25	5	37
26	16	0	26	4	58	26	5	59
27	15	41	27	4	34	27	6	23
28	15	22	28	4	11	28	6	45
29	15	4				29	7	8
30	14	44				30	7	30
31	14	25				31	7	51

South. Declination

Aprill.				Maie.				Iune.		
D.	G	M		D.	G.	M		D.	G.	M
1	8	14		1	17	50		1	23	6
2	8	35		2	18	4		2	23	11
3	8	58		3	18	20		3	23	14
4	9	20		4	18	36		4	23	18
5	9	42		5	18	49		5	23	22
6	10	3		6	19	4		6	23	23
7	10	24		7	19	18		7	23	24
8	10	45		8	19	31		8	23	27
9	11	6		9	19	44		9	23	29
10	11	27		10	19	56		10	23	30
11	11	47		11	20	8		11	23	30
12	12	7		12	20	22		12	23	30
13	12	28		13	20	34		13	23	30
14	12	47		14	20	46		14	23	29
15	13	7		15	20	56		15	23	28
16	13	26		16	21	6		16	23	26
17	13	46		17	21	16		17	23	24
18	14	6		18	21	28		18	23	22
19	14	23		19	21	38		19	23	19
20	14	42		20	21	46		20	23	15
21	14	59		21	21	54		21	23	12
22	15	19		22	22	3		22	23	7
23	15	36		23	22	11		23	23	3
24	15	54		24	22	19		24	22	58
25	16	11		25	22	26		25	22	52
26	16	28		26	22	33		26	22	47
27	16	46		27	22	40		27	22	41
28	16	59		28	22	46		28	22	34
29	17	18		29	22	32		29	22	27
30	17	34		30	22	57		30	22	20
				31	23	3				

North. Declination. North. Solstice. Declination.

North Declination. Sun in the Equinoctial South Declination.

Iulie.			Auguſt.			Septemb.		
D.	G.	M	D.	G.	M.	D.	G.	M
1	22	63	1	15	26	1	4	43
2	22	5	2	15	8	2	4	20
3	21	56	3	14	50	3	3	57
4	21	47	4	14	32	4	3	34
5	21	39	5	14	13	5	3	11
6	21	29	6	13	54	6	2	47
7	21	20	7	13	35	7	2	23
8	21	9	8	13	16	8	2	1
9	20	59	9	12	57	9	1	37
10	20	48	10	12	37	10	1	14
11	20	37	11	12	17	11	0	51
12	20	25	12	11	57	12	0	27
13	20	13	13	11	36	13	0	4
14	20	0	14	11	16	14	0	19
15	19	49	15	10	55	15	0	43
16	19	35	16	10	35	16	1	7
17	19	22	17	10	14	17	1	30
18	19	9	18	9	53	18	1	53
19	18	53	19	9	31	19	2	17
20	18	39	20	9	10	20	2	40
21	18	25	21	8	49	21	3	3
22	18	10	22	8	27	22	3	27
23	17	55	23	8	5	23	3	51
24	17	40	24	7	43	24	4	13
25	17	25	25	7	21	25	4	37
26	17	8	26	6	59	26	5	0
27	16	52	27	6	36	27	5	23
28	16	35	28	6	15	28	5	46
29	16	19	29	5	51	29	6	9
30	16	2	30	5	28	30	6	33
31	15	44	31	5	6			

North Declination.

October.				November.				December.		
D.	G.	M.		D.	G.	M.		D.	G.	M.
1	6	56	South. Declination.	1	17	24	South. Solstice.	1	23	3
2	7	19		2	17	41		2	23	7
3	7	41		3	17	57		3	23	12
4	8	3		4	18	13		4	23	15
5	8	26		5	18	29		5	23	19
6	8	48		6	18	44		6	23	22
7	9	10		7	18	59		7	23	24
8	9	32		8	19	14		8	23	26
9	9	54		9	19	28		9	23	28
10	10	16		10	19	42		10	23	29
11	10	18		11	19	56		11	23	30
12	10	59		12	20	9		12	23	30
13	11	20		13	20	22		13	23	30
14	11	41		14	20	34		14	23	29
15	12	2		15	20	46		15	23	28
16	12	23		16	20	58		16	23	26
17	12	44		17	21	9		17	23	24
18	13	4		18	21	20		18	23	21
19	13	24		19	21	30		19	23	18
20	13	44		20	21	40		20	23	14
21	14	4		21	21	50		21	23	10
22	14	24		22	21	59		22	23	5
23	14	44		23	22	8		23	23	0
24	15	2		24	22	17		24	22	54
25	15	20		25	22	25		25	22	50
26	15	38		26	22	32		26	22	43
27	15	57		27	22	39		27	22	36
28	16	15		28	22	46		28	22	28
29	16	33		29	22	52		29	22	21
30	16	50		30	22	57		30	22	13
31	17	7						31	22	5

Ianuarie.				Februarie.				March.			
D.	G.	M.		D.	G.	M.		D.	G.	M.	
1	21	54	South.	1	14	10	South declination.	1	3	30	North declination.
2	21	45		2	13	50		2	3	6	
3	21	35		3	13	30		3	2	42	
4	21	25		4	13	10		4	2	18	
5	21	15		5	12	50		5	1	55	
6	21	4		6	12	29		6	1	39	
7	20	54		7	12	8		7	1	7	
8	20	40		8	11	47		8	0	43	
9	20	28		9	11	26		9	0	21	
10	20	15		10	11	5	Sun in the	10	0	4	
11	20	2		11	10	43	Equinoctial	11	0	28	
12	19	48		12	10	21		12	0	52	
13	19	34		13	10	0		13	1	15	
14	19	20		14	9	37		14	1	38	
15	19	5		15	9	15		15	2	2	
16	18	50		16	8	53		16	2	25	
17	18	35		17	8	30		17	2	49	
18	18	20		18	8	7		18	3	13	
19	18	4		19	7	44		19	3	36	
20	17	47		20	7	22		20	3	59	
21	17	30		21	7	0		21	4	22	
22	17	14		22	6	36		22	4	45	
23	16	57		23	6	13		23	5	9	
24	16	39		24	5	49		24	5	32	
25	16	22		25	5	26		25	5	34	
26	16	4		26	5	3		26	6	17	
27	15	45		27	4	39		27	6	40	
28	15	26		28	4	16		28	7	3	
29	15	8		29	3	52		29	7	25	
30	14	49						30	7	47	
31	14	30						31	8	9	

Declination

Aprill.				Maie.				Iune.		
D.	G.	M		D.	G.	M		D.	G.	M
1	8	31		1	17	59		1	23	8
2	8	53		2	18	16		2	23	13
3	9	15		3	18	30		3	23	16
4	9	36		4	18	46		4	23	19
5	9	58		5	18	59		5	23	27
6	10	19		6	19	14		6	23	25
7	10	40		7	19	26		7	23	26
8	10	59		8	19	40		8	23	28
9	11	22		9	19	54		9	23	29
10	11	43		10	20	6		10	23	30
11	12	3		11	20	14		11	23	30
12	12	23		12	20	30		12	23	30
13	12	43		13	20	42		13	23	29
14	12	59		14	20	53		14	23	28
15	13	20		15	21	4		15	23	26
16	13	40		16	21	14		16	23	24
17	13	59		17	21	25		17	23	22
18	14	19		18	21	34		18	23	19
19	14	36		19	21	44		19	23	16
20	14	56		20	21	52		20	23	12
21	15	14		21	21	59		21	23	7
22	15	32		22	22	9		22	23	3
23	15	50		23	22	16		23	22	59
24	16	7		24	22	25		24	22	54
25	16	25		25	22	30		25	22	48
26	16	40		26	22	38		26	22	42
27	16	56		27	22	45		27	22	36
28	17	14		28	22	49		28	22	29
29	17	30		29	22	55		29	22	22
30	17	46		30	22	59		30	22	15
				31	23	4				

North. Declination. North. Solstice. Declination.

Iulie.			North Declination, Sun in the Equinoctial South Declination.	Augusti.				Septemb.		
D.	G.	M.		D.	G.	M.		D.	G.	M.
1	22	7		1	15	13		1	4	25
2	22	58		2	14	54		2	4	2
3	22	50		3	14	36		3	3	40
4	22	41		4	14	18		4	3	16
5	22	32		5	14	0		5	2	53
6	22	22		6	13	40		6	2	30
7	22	13		7	13	20		7	2	5
8	22	2		8	13	0		8	1	42
9	20	51		9	12	42		9	1	20
10	20	40		10	12	23		10	0	57
11	20	28		11	12	2		11	0	33
12	20	17		12	11	42		12	0	10
13	20	4		13	11	21		13	0	14
14	19	52		14	11	0		14	0	38
15	19	39		15	10	40		15	0	59
16	19	26		16	10	20		16	1	24
17	19	12		17	9	58		17	1	46
18	18	58		18	9	36		18	2	12
19	18	44		19	9	14		19	2	34
20	18	30		20	8	54		20	2	59
21	18	15		21	8	32		21	3	22
22	18	0		22	8	10		22	4	45
23	17	44		23	7	50		23	4	6
24	17	28		24	7	36		24	4	30
25	17	13		25	7	4		25	4	55
26	16	56		26	6	42		26	5	17
27	16	40		27	6	20		27	5	40
28	16	24		28	5	55		28	6	3
29	16	5		29	5	33		29	6	26
30	15	48		30	5	11		30	6	50
31	15	30		31	4	48				

North. Declination,

October.				November.				December.		
D.	G.	M.		D.	G.	M.		D.	G.	M.
1	7	12	South.	1	17	36	South.	1	23	6
2	7	26		2	17	53		2	23	10
3	7	58		3	18	9		3	23	15
4	8	20		4	18	25		4	23	19
5	8	42		5	18	40		5	23	21
6	9	5		6	18	55		6	23	24
7	9	26		7	19	10		7	23	26
8	9	49		8	19	24		8	23	28
9	10	10		9	19	38		9	23	29
10	10	33		10	19	52		10	23	30
11	10	54		11	20	6	Solstice.	11	23	30
12	11	16		12	20	18		12	23	30
13	11	36		13	20	30		13	23	29
14	11	56		14	20	43		14	23	28
15	12	18		15	20	54		15	23	26
16	12	39		16	21	6		16	23	24
17	12	59		17	21	16		17	23	22
18	13	19		18	21	28		18	23	19
19	13	39	Declination.	19	21	38	Declination.	19	23	15
20	13	59		20	21	48		20	23	11
21	14	20		21	21	56		21	23	6
22	14	39		22	22	6		22	23	1
23	14	58		23	22	14		23	22	56
24	15	16		24	22	22		24	22	50
25	15	34		25	22	30		25	22	44
26	15	52		26	22	37		26	22	37
27	16	17		27	22	44		27	22	30
28	16	29		28	22	50		28	22	23
29	16	46		29	22	56		29	22	15
30	17	4		30	23	2		30	22	7
31	17	21						31	22	58

The sixt Chapter shewing how to take the height of the Sunne with the crosse staffe, or with the Astrolabe, and also how to find the true Meridian, with other necessarie matters.

TO take the true height of the Sunne at the sea, the best way is, to do it with the Crosse staffe, for that the sea is moueable, and causeth the ship to heane & set little or much. And also vpon the crosse staffe the degrees be larger marked then the ring or Astrolabe: and in a large instrument, an error is seene sooner & better, than it is in a small instrument.

How to obserue the Sun.

Now to take the height of the Sun, to know the Altitude of the Pole aboue the Horizon, do this: first set the sun with a compasse to know when he cometh neere vnto the Meridian: as soone as you see that the sun is come vnto the South and by East, then begin to take his height with the crosse staffe, in this manner: put the Transuersary vpon the long staffe, then set the end of the long staffe close at the corner of your eie, winking with your other eie, & remouing the Trãsuersarie forward or backwards, til you do see the lower end of it (being iust with the horizon) and the vpper end of it (being iust with the middle of the sun) both to agree with the sun & the Horizon at one time: and so haue you the true height of the sun. This done, still obserue the same, vntill you see the sun at ỳ highest, & begining to descend, thẽ haue you finished.

To take the height of the Sunne with the crosse staffe.

But note that if you obserue with the staffe in the top of the ship, and in the mid waste, and least of the ship, you shall find great difference; so also betweene your obseruation on the top of a great billow, where the seas run whole and in the bottome betweene two great billowes, your best place to obserue is on the top of a great billow.

Yet not withstanding this is to be noted, that it is best to take the height of the sun with the crosse staffe, when the sun is vnder fiftie degrees in height about the Horizon, for two causes. The one as this: vntill you come to 50. degrees, the degrees be large by marken vpon the crosse staffe, but after 50 degrees they be all to marked: the other is, the sunne being vnder 50. degrees in height, you may easily take the

The cause why the crosse staffe is best to take the height of the Sunne vnder 50 degrees.

the height, because you may easily see or view to the vpper ende and the neather ende of the Crosse staffe both at one time: but if it doth exceede 50. degrees, then by the meanes of casting your eye vpwards and downewards so much, you may soone commit errour, and then in like manner the degrees be so small marked, that if the sunne doth passe 50. or 60. degrees in height, you must leaue the crosse staffe, and vse the Marriners Ring, called by them the Astrolaby.

To take the height of the Sunne with the Astrolaby. How to correct your Astrolaby if it doth not hang vpright.

Now to take the height of the Sunne with the common Ring or Astrolabie, doe thus: The Sunne being (as before is declared) neere the Meridian or South, obserue it (vntill you haue the greatest height thereof) in this manner: Holde the Ringe of the Astrolabie vpon one of your fingers, and turne the Alhidada vp and downe, vntill you see the shadow of the Sunne pearce or passe through both the sights thereof, being sure that the Astrolable doth hang vpright, which you may proue in this manner.

Looke at how many degrees and minutes the Alhidada doth stand vpon the Astrolabie, then turne the Alhidada vnto the same number of the degrees and minutes on the other side of the Astrolabie, and then taking the height of the sunne againe, if it doe agree as it did before, then the Astrolabie doth hang vpright: but if it doe not, then it doth not hang vpright. For knowledge of the true height of the sunne (the Astrolabie not hanging vpright) do thus: If the Astrolaby be truly marked, marke the diuersity, that being knowen, rebate from the greatest height halfe the diuersite, or else adde vnto the lesser height halfe the diuersitie, & that shalbe the true height of the Sunne, although that the Astrolabie doth not hang vpright.

The Astrolaby is best to take the hight of the Sunne, if the sunne be very high, at 90. 70. or 80. degrees: and the cause is this: The sunne comming neere vnto your Zenith, hath great power of light, so to pearce the two sights of Alhidada of the Astrolaby, and then it is not good to vse the crosse staffe, for that the sunne hurteth the eies of a man, & besides that,

that it is too high to occupie the croſſe ſtaffe, (as before is declared) ſo that this way you may very much preſerue your eies. If you haue not glaſſes vpon your ſtaffe (to ſaue your eies in taking the height of the Sun) but be vnprouided of them, do thus: take and couer the ſunne with the end of the Tranſuerſarie of the croſſe ſtaffe, vnto ẏ very vpper edge or brimme of the ſunne, (ſo ſhal you not need to behold ẏ brightneſſe of it) and with the other end of the Tranſuerſarie to take the Horizon truly, and that being done, becauſe the Sunne is 30. or 31. minutes in Diameter or breadth, therefore you ſhall rebate 15. minutes from ẏ Altitude or height of the Sunne, and then that which ſhall remaine, ſhal be the true height of the Sunne, from the Centre or middle of the Sunne. And furthermore, there is ſome errour in the taking the ſunne or ſtarre with the Ballaſtell or Croſſe ſtaffe, and that groweth by this meanes: for that the true Centre (which is the light of the eye) is within in the middle of the eye, and not in the outſide of the eye: ſo that the end of the long ſtaffe in the ſeting of it vnto the corner of your eie, doth ſtand ſomewhat further out then the light of your eye, that is to ſay, that the light of the eie is ſomewhat further into ẏ head, then the end of the ſtaffe doth come vnto: wherefore you muſt pare away a little of the end of the ſtaffe, for ſome mens byes more, and ſome mens byes leſſe, for that it is according as you may ſet the ſtaff vnto the eie, for ſome men need pare away little or nothing, and ſome men muſt pare away 14. or 15. minutes, as you may ſet the ſtaffe, becauſe ſome mens eyes be further into their head, then other ſome mens are, and the bones of ſome mens face ſtand further out then other ſome doe.

How to preſerue your eyes whē you touch the Sunne with the croſſe ſtaffe, and haue no glaſſes.

The Diameter of the Sun is 30 or 31. minutes.

Some errour in the croſſe ſtaffe and how to reforme it.

It is moreouer conuenient to knowe the Meridian or ſouth, which you muſt doe either with a good Compaſſe, or with a perfect Diall or Needle: but if you bee on the land, this you may do on a peece of timber or any other thing that ſtādeth faſt, with apayre of compaſſes make a circle, then in the middle or center where the fote of the cōpaſſe did ſtand, ſet

To get the true Meridian vpon the Land.

set a wier vpright (as circumspectly as you can) and the you may doe this: looke in ỹ morning (so it be on plaine ground, that you may see the Horizon circle, without any lette at the Sunne rising, for the shadow of the wire) and there set a prick: then at the setting of the Sunne you shall set another pricke, euen at the circumference of the circle, then diuide that with your compasses euen in two peeces, and strike a straight line from the wyre or center of the circle, to the middle or deuided pricke, and that shall bee the true Meridian. Or else (the wyer standing vpright) first in the forenoone when the toppe of the wyer doth touch, or is readie to come into the circumference or edge of the circle, there make a pricke: then in the afternoone in like manner, where the shadowe of the wyer toucheth the edge of the Circle, there make an other pricke euen with the end out of the shadow: this done (as circumspectly as you can) deuide these two pricks in the middle, then as is before said, draw a line from ỹ center or wyer, to the middle pricke, and that shadow shall bee your true Meridian.

After an other manner you may do this: looke and watch when the wier giueth the shortest shadow, and there make a pricke, then draw a line from that pricke to the wyer, which shall be the true Meridian.

And yet furthermore, for that it is most conuenient to know the true Meridian at the sea, because in long voiages, going farre vnto the Westward or Eastward, the compasse doth varie: to find the true Meridian, do this: Set the sunne with your compasse at his rising or appearing aboue ỹ Horizon, and then (knowing what point and part of the sunne doth rise at) set the Sunne with your Compasse at the setting or departing vnder the Horizon, and (that being knowen) you shall perfectly know whether the Compasse be varied, and how much, by the diuiding the peece of the circle contained betweene the rising and setting of the sun into two equal parts, for the right line drawn frō the center of the fire through ỹ point of the partition expresseth ỹ true Meridian,

To know the true Meridian at the Sea, and also if your Compasse be varied, and to know how much they be varied.

and

and the proportion of the circle contained betweene the said line and ỹ South point of your compasse sheweth the quantitie of the variation. For ensample this, I do set the Sunne at his rising with the compasse, and he doth rise vpō the East point: in like maner also I doe set the Sunne with the compasse at her setting, and doe find her to set West Northwest: so I do see the compasse to be varied one point, that is to say, the North point doth stand North and by East, &c. And furthermore, (for that seldome times the Sunne doth rise and set cleere by the meanes of the clouds, & other impediments next the Horizon) you may get the true Meridian thus: at any time in the forenoone, first set ỹ Sunne with your compasse, and then take the true height of the Sunne.

Now you (knowing how many degrees the Sunne was high at that point of the compasse) you may in like manner observe the Sunne in the afternoone, vntill you do finde the Sunne iust at that height that it was in the forenoone, marking at what point of the compasse the Sunne is, and so shal ye see perfectly whether the compasse be varied or no, & also how much: for ensample thus, I take the Sunne vpon the Southeast point 20. degrees aboue the Horizon, and then in the afternoone, I doe observe the Sunne vntill such time as I doe find the Sunne iust 20. degrees aboue the Horizon againe, and then I set the Sunne with the compasse, and doe finde the Sunne to be at 20. degrees in height Westsouthwest, so that I sée the cōpasse to be varied one point, that is to say, the North point doth stand North and by East, &c.

An other way also to know the true Meridian by the sun is this: to set the Sunne with the compasse at her greatest height aboue the Horizon, and so you shall know whether ỹ compasse be varied, and how much: and loke what is spoken of the sunne by day, you may doe the like by night by any of ỹ starres that you perfectly do know, doing as you do by the sunne in all points: but you cannot do it so well and truely by the Moone, by the meanes of the swiftnes of her motion in the Zodiacke; you may also finde the variation by ỹ compasse

To finde the variation of the compasse in the night by the starres, but not by the Moone.

set a wier vpright (as circumspectly as you can) and the you may doe this: loke in ỹ morning (so it be on plaine ground, that you may see the Horizon circle, without any lette at the Sunne rising, for the shadow of the wire) and there set a prick: then at the setting of the Sunne you shall set another pricke, euen at the circumference of the circle, then diuide that with your compasses euen in two peeces, and strike a straight line from the wyre or center of the circle, to the middle or deuided pricke, and that shall bee the true Meridian. Or else (the wyer standing vpright) first in the forenoone when the toppe of the wyer doth touch, or is readie to come into the circumference or edge of the circle, there make a pricke: then in the afternoone in like manner, where the shadowe of the wyer toucheth the edge of the Circle, there make an other pricke euen with the end out of the shadow: this done (as circumspectly as you can) deuide these two pricks in the middle, then as is before said, draw a line from ỹ center or wyer, to the middle pricke, and that shadow shall bee your true Meridian.

After an other manner you may do this: looke and watch when the wier giueth the shortest shadow, and there make a pricke, then draw a line from that pricke to the wyer, which shall be the true Meridian.

And yet furthermore, for that it is most conuenient to know the true Meridian at the sea, because in long voiages, going farre vnto the Westward or Eastward, the compasse doth varie: to find the true Meridian, do this: Set the sunne with your compasse at his rising or appearing a boue ỹ Horizon, and then (knowing what point and part of the sunne doth rise at) set the Sunne with your Compasse at the setting or departing vnder the Horizon, and (that being knowen) you shall perfectly know whether the Compasse be varied, and how much, by the diuiding the pæce of the circle contained betweene the rising and setting of the sun into two equal parts, for the right line drawn frō the center of the fire through ỹ point of the partition erecteth ỹ true Meridian,

To know the true Meridian at the Sea, and also if your cōpasse be varied, and to know how much they be varied.

and

and the proportion of the circle contained betweene the said line and ỹ South point of your compasse sheweth the quantitie of the variation. For ensample this, I do set the Sunne at his rising with the compasse, and he doth rise vpō the East point: in like maner also I doe set the Sunne with the compasse at her setting, and doe find her to set West Northwest: so I do see the compasse to be varied one point, that is to say, the North point doth stand North and by East, &c. And furthermore, (for that seldome times the Sunne doth rise and set cleere by the meanes of the clouds, & other impediments nere the Horizon) you may get the true Meridian thus: at any time in the forenoone, first set ỹ Sunne with your compasse, and then take the true height of the Sunne.

Now you (knowing how many degrees the Sunne was high at that point of the compasse) you may in like manner obserue the Sunne in the afternoone, vntill you do finde the Sunne iust at that height that it was in the forenoone, marking at what point of the compasse the Sunne is, and so shal ye see perfectly whether the compasse be varied or no, & also how much: for ensample thus, I take the Sunne vpon the Southeast point 20. degrees aboue the Horizon, and then in the afternoone, I doe obserue the Sunne vntill such time as I doe find the Sunne iust 20. degrees aboue the Horizon againe, and then I set the Sunne with the compasse, and doe finde the Sunne to be at 20. degrees in height Westsouthwest, so that I sée the cōpasse to be varied one point, that is to say, the North point doth stand North and by East, &c.

An other way also to know the true Meridian by the sun is this: to set the Sunne with the compasse at her greatest height aboue the Horizon, and so you shall know whether ỹ compasse be varied, and how much: and loke what is spoken of the sunne by day, you may doe the like by night by any of ỹ starres that you perfectly do know, doing as you do by the sunne in all points: but you cannot do it so well and truely by the Moone, by the meanes of the swiftnes of her motion in the Zodiacke; you may also finde the variation by ỹ compasse

To finde the variation of the compasse in the night by the starres, but not by the Moone.

passe of the north Starre, as thus: set the north Starre with the Compasse, if the north point do stand right with the star, then it is not varied: but if it doth not stand with the star, then it is varied: and that must be done when the two stars of Charles waine called the Pointers, be right vnder, or right ouer the north Starre; but if the Starres be West from the north Starre, then the north Starre is the third part of a point vnto the Eastward of the north Pole. If the two Starres of Charles waine, called the Pointers, be due east from the North Starre, then the North Starre, is the third part of a point vnto the westward of the North Pole, &c.

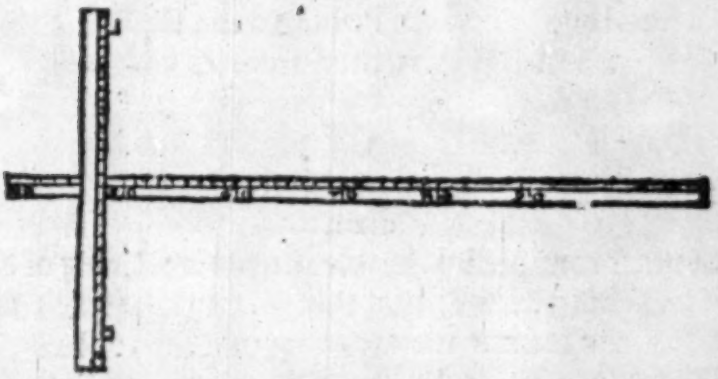
This haue I said, because that somtime in sundry places, the Compasse doth varie (the variation is called the Northeasting or Northwesting of the Compasse) especially in the sayling of long voyages, running East and West, therefore I would not wish them to meddle with the mending of their Compasse, or whetting of the side of the Needle, to the end to make it stand due North, but circumspectly to awaite the altering of the Compasse, and what quantity it doth alter: as you may do very well by the order before rehearsed, and then let your Compasse alone: for although it doth varie two or three points, you may make account according to the variation, as thus; I admit the Northwest point standeth due North, and my course is to go due West, I will occupie the southwest point in this case for the West point. And thus (by obseruation and trying of my Compasse) I care not what point standeth due North, for it is all one, so that you consider what point standeth North. And also there is deuised by one Norman a Compasse-maker, a very necessarie deuice in a Compasse, that you may set the North point vpon what degree you list, according vnto the true variation of the Compasse, at all times at your pleasure.

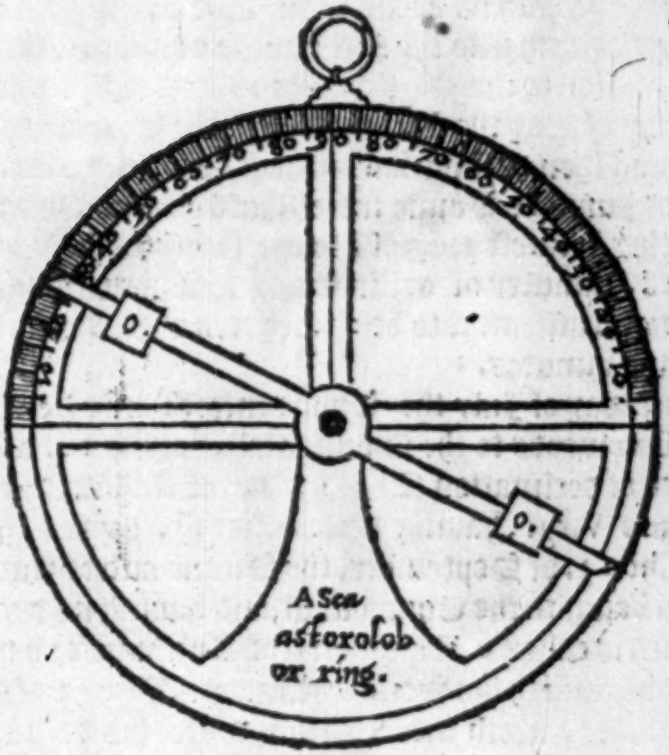
Meddle not with your Compasse although it be varied.

To saile by the Compasse that is varied.

The Bella Stella or Croſſe ſtaffe,

To take the height of the Sunne or Starre.





The vii. Chapter sheweth how to handle the declination of the Sunne, to know the Altitude of the North Pole aboue the Horizon, (the height of the Sunne being truely taken and knowen, in any place betweene the North Pole and the Equinoctiall) so that the Sunne be vnto the Southwards of you at the taking of the Sun vpon the Meridian.

YOU must consider by the Regiment or Table of declination (going before) that the 10. day of March in the yeere 1605. the Sunne is in the Equinoctiall, entring then the first point of Aries (called the Equinoctiall, of the spring-time) where he hath no declination. The 10. day of Aprill, the Sunne entreth into the first minute of Taurus, then hauing declination to the Northwards 11. degrées 30. minutes The 11. day of May the Sunne entreth the first point of Gemini, hauing then declination 20. degrées 11. minutes. The 11. day of June the Sunne entreth into Cancer, where hee (making his greatest progresse to the Northwards) hath 23 degrées 28. minutes of declination. But now in this our time, some do affirme it to be 23. degrees and a halfe, but it lacketh two minutes.

The greatest declination of the Sunne.

The 13. day of July the Sunne entreth into Leo, comming downewards to the Equinoctiall, hauing 20. degrees 8. minutes of declination. The 13. day of August, the Sun entreth into Virgo, hauing declination 11. degrees 29. minutes. The 13. of September, the Sunne entreth into Libra, (then being in the Equinoctiall, and hauing no declination) which is called ỹ Equinoctial of Autumne or harueſt. where he beginneth his South declination. The 13. of October the Sunne entreth into Scorpio, where his declination is 11. degrees 30. minuts. The 12. of Nouember the Sun entreth into Sagittarius, his declination being 20. degrees 12. mi-

Equinoctiall of Autumne.

12. minutes. The 12. day of December the Sunne entreth the first minute of Capricorne, where the Sunne (making the greatest progresse to the Southwards) hath of declination 23. degrees and 28. minutes. From whence he returneth to the Equinoctiall againe. The 10. of Januarie the Sunne entereth into Aquarius, where his declination is 20 degrees 12. minutes. The ninth day of February the sunne entreth into the first minute of Pisces, and hath declination 11. degrees 30. minutes. The 11. day of March, the sunne returneth to the self same place that it departed from before: wherefore the Egyptians did paint the yeere like to an Adder biting her taile, not having the vse of letters. And the Romanes called a Ring, Annulus, as it were Annus, that is to say, a yeere, because a Ring doth turne round in it selfe, as doth the yeere. The Meridian height of the Sunne being known, you knowing the day of the moneth, and what yeere it is after the Bissextilis, must turn to the day of the moneth, in the Regiment or Table going before, where right against the day of the moneth you shall finde the degrees of declination, and the odde minutes belonging to the degrees of declination following: that being knowen (that is to say, the Meridian height of the Sun with the degrees and minutes of the declination) consider with your self whether the sunne declineth from the Equinoctiall toward the Pole, which is aboue the Horizon, or toward that Pole, which is vnder the Horizon. If the Sunne declineth from the Equinoctiall toward that Pole which is aboue the Horizon, you must alwaies subduct the declination from the Meridian Altitude of the sunne, the remainder is the height of the Equinoctiall. The height of the Equinoctiall being subducted from 90. yeeldeth the height of the Pole aboue the Horizon. But if that the sunne declineth toward that Pole which is vnder the Horizon, you shall adde or put that declination vnto the height of the sunne, the totall summe shall shew vnto you the true height of the Equinoctiall, the which summe being taken from 90. that which doth remaine, shall bee the Alti-

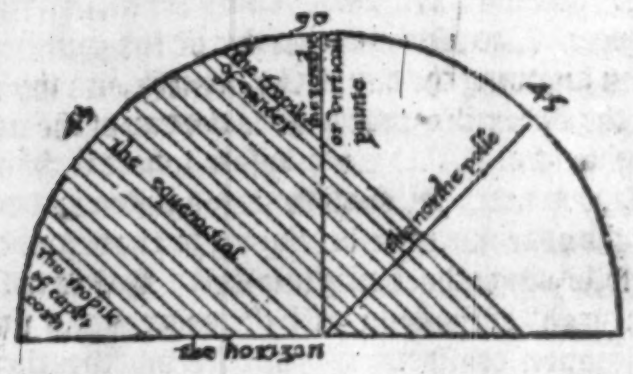
The greatest declination to the South.

The yeere is compared vnto a Ring or Adder biting her taile.

The height of the Sunne being taken and knowen, then how to handle the declination, to know the height of the Poles.

Things to bee noted as touching the taking of the Altitude of the Pole.

tude of the Pole aboue the Horizon. For this is to be noted: that what height the Equinoctial is aboue the Horizon, such is the distance betweene the Zenith or verticall point, and the Pole. In like manner, loke how many degrees and minutes are betweene the Equinoctiall and your Zenith, so many degrees and minutes are from the Pole downe to the Horizon, & this is the cause why you must take the height of the Equinoctiall, out of 90. degrees. For your Zenith being alwaies 90. degrees from the Horizon (as you see by this figure following) the height of the Equinoctiall being taken out of that number, leaueth the distance betweene the Zenith, and the Equinoctiall, which is equall to the height of the Pole aboue the Horizon.



The viij. Chapter sheweth you how to handle the declination of the Sunne: when you are between the Equinoctiall and the Sunne: that is to say, the Sunne being to the Southwards or Northwards of you, betweene the Sunne and the Equinoctiall, or vnder the Equinoctiall: the height of the Sunne being truly knowen or taken.

NOW furthermore if you bee vnto the South parts neere vnto the Equinoctiall, so that the Sunne haue any great declination eyther to the Southwards, or to the Northwards, you being betweene

tweene the Equinoctiall and the Sunne, when you haue taken the true height of the Sunne, with the Astrolabie to know the height of any of the two Poles, do this: seeke the declination of the Sunne for that day, with the degrees and minutes; the declination being known and the height of the Sunne in like manner, then add the declination of the Sun vnto the height thereof, and it will exceed or bee more than 90. degrees: then againe loke how many degrees it is more than 90. that shall be the true height of the Pole towards that side that the Sunne is: because the Equinoctiall is the number of degrees aboue 90. (which is your Zenith) to the contrary part from the Sunne-ward. For (as I haue said in the Chapter going before, and it is general for euer) what height soeuer the Equinoctiall is from the Horizon, that is the true distance betweene the Zenith and the Pole: In like manner, loke what distance is betweene the Equinoctiall and the Zenith, the same is the true distance betweene the Horizon and the Pole, that is to say, the Pole is so many degrees in Altitude aboue the Horizon. And whereas it is a common saying (in searching how farre wee be vnto the Southwards or Northwards) that the Pole Article is so many degrees in Altitude, or (as some will say) that we are so many degrees in Latitude: that saying is all one in respect, although the one be called Altitude or height, and the other Latitude or wideneſſe: for as when you say Altitude or height of the Pole, you mean the Pole is raised so many degrees aboue the Horizon: so likewise when you say Latitude, you meane, you be so many degrees in wideneſſe from the Equinoctiall, for that your Zenith or verticall point is so many degrees from the Equinoctiall, as the Altitude is found to bee. Moreouer, if you chaunce to bee right vnder the Equinoctiall, as you cannot say that you haue any Latitude, so likewise cannot you say that you haue any Altitude, for that the two Poles be then iuſt with your Horizon, and in like manner the Equinoctiall passeth by your Zenith or verticall point. But when you will take

Altitude or Latitude is all one questiō in effect

Being vnder the Equinoctiall, you haue neyther Latitude nor Altitude, for that the Equinoctiall is your Zenith, & the Pole your Horizon.

the height of the Sunne with your Astrolabie, then looke what declination of the Sunne hath, eyther to the Southwards or Northwards. Then put the declination of the Sunne vnto the height of the same, and the number will be iust 90. degrees: if it lacketh any thing of 90. degrees, then it signifieth that the Equinoctiall lacketh so much of the Zenith, and so much iust shall the Pole be aboue the Horizon, towards that part that you be in from the Sunwards. But contrariwise if it doth exceed, or be any thing more than 90. degrees, then (as afore is declared) it signifieth that the Equinoctiall is as much as that number (both in degrees and minutes.) On the contrary side from the Sunwards, that is to say, your Zenith shall be betweene the Sunne and the Equinoctiall, and the Pole shall bee so many degrees or minutes aboue the Horizon, as is the distance betwéen the Zenith and the Equinoctiall, towards that part or side that the Sun is on. Wherefore I do thinke it necessary to giue certaine ensamples (and first take this for an ensample.) Admit I doe take the height of the Sun vnto the Northwards 80. degrées aboue the Horizon, and the Sunne hath declination vnto the Northwards 20. degrées, to which I adde or put the height, that is to say 80. degrées, being the height of the Sunne, and 20. degrées, being the declination of the Sun, doe make 100. from which I pull 90. away, which is my Zenith, and so there remaineth 10. degrées. Wherefore you may conclude, that the Equinoctiall is 10. degrées to the South part of the Zenith, and the Sunne to be 10. degrées to the North part of your Zenith, so that the North Pole is 10. degrées aboue the Horizon, as by ensample it is declared.

Of your Zenith being betweene Equinoctiall and the Sunne.

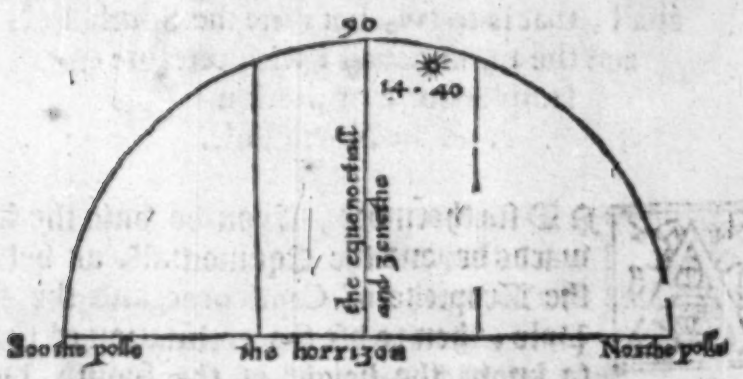
An ensample.

An ensample where the Pole is 10. degrees aboue the Horizon.

And

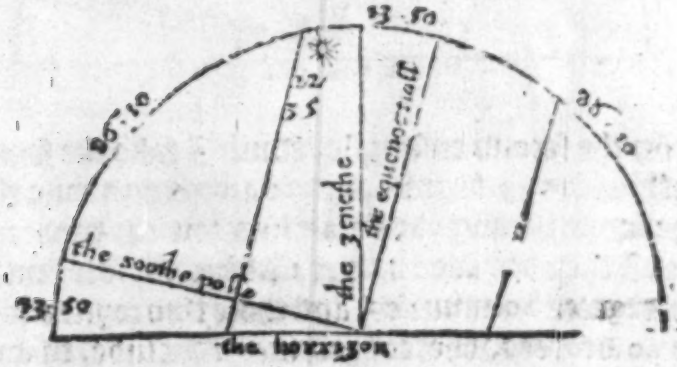


And for the second ensample, admit I take the Sun vnto the Northwards 75. degrees, and 20. minutes aboue the Horizon, the sunne hauing North declination 14. degrees forty minutes, I then doe adde or put 14. degrees, forty minutes, vnto 75. degrees 20. minutes, and those two ioyned together maketh 90. degrees, whereof you may conclude, that the Equinoctiall is your Zenith, and then the two Poles be within your Horizon, as by this example it doth appeare.



And now followeth to the third ensample. I admit the Sunne be taken with the Astrolaby 81. degrees and 15. minutes aboue the Horizon, and the sunne hath south declination 22. degrees 35. minutes; whereof I doe adde or put together 81. degrees and 15. minutes, being the height of the sunne, and 22. degrees 35. minutes being the declination, & that maketh 103. degrees, 50. minutes: from which I take An ensample.

away 90. degrees, which is my Zenith, so that there remaineth 13. degrees, 50. minutes: so that you may safely conclude, that the Equinoctiall is 13. degrees 50. minutes, vnto the North parts of the Zenith, and then it must needs follow, that the south Pole is 13. degrees, 50. minutes above the Horizon, as by this ensample it is declared.



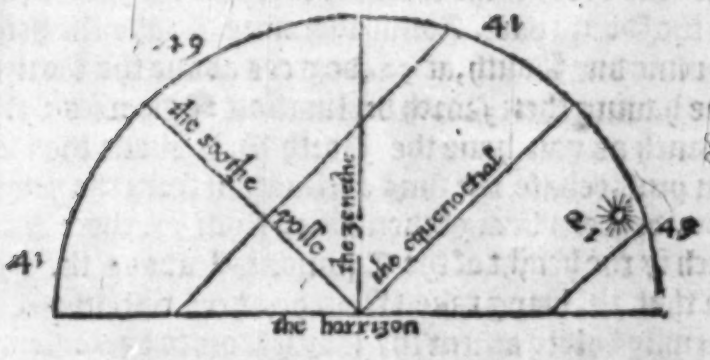
¶ The ninth Chapter sheweth how to handle the declination of the Sunne, when you are beyond the Equinoctiall, that is to say, betweene the South Pole and the Equinoctiall: with certaine ensamples both for the South Pole and the North Pole.

AND furthermore, if you be vnto the Southwards beyond the Equinoctiall, as betweene the Tropicke of Capricorne and the South Pole, then to vse the declination of the Sun to know the height of the South Pole or Antarticke Pole, by the height of the Sunne, there is no other matter in the doing thereof, but whereas we (beeing vnto the North parts) doe adde the South declination vnto the height of the Sunne, and rebate the North declination from the height of the Sunne, so in like manner the contrary is to bee vsed, that is to say, to rebate the South declination from the height of the Sunne

To take the Sunne to the Northward, you being betweene the South Pole and the Equinoctial

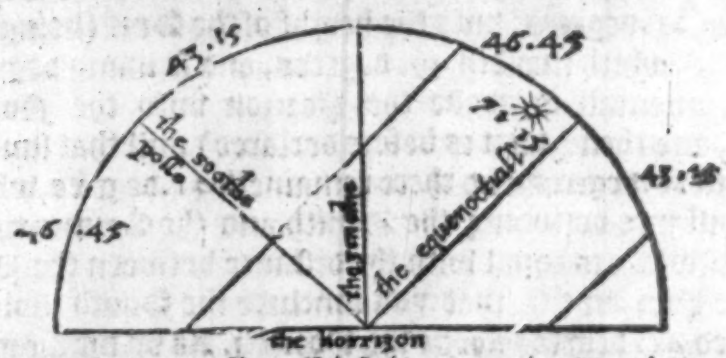
Sunne, and to adde vnto the height of the Sun the North declination. As for example, I admit the height of the Sunne be taken 28. degrees aboue the Horizon due North, and the declination of the Sunne is 21. degrees vnto the Northwards, I doe then adde the declination of the Sunne which is 21. degrees, vnto the height of the Sun (being 28. degrees,) which maketh 49. degrees, and so many degrees the Equinoctiall is aboue the Horizon vnto the Northwards, and then (as it is before declared) pull that summe out from 20. degrees, and there remaineth 41. degrees, which is the distance betweene the Zenith and the Equinoctiall, which alwaies is equal with the distance between the Pole and the Horizon: so that you conclude the South Pole to be raised 41. degrees aboue the Horizon. As by the figure it is shewed.

An example by taking the south Pole 41. degrees aboue the Horizon.



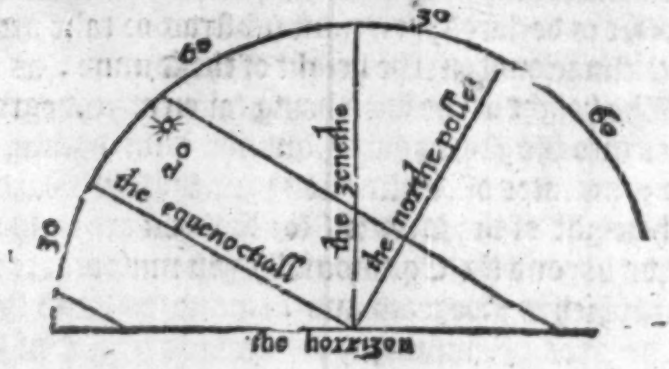
And furthermore if the Sunne hath South declination, then (as before is declared) you must substract or take away the Suns declination from the height of the Sunne, as for ensample. The height of the Sun being taken at 50. degrees 30. minutes into the North parts, and the Sun hauing 7. degrees ♃ 15. minutes of declination vnto the southwards, from which height of the Sunne (for that you are vnto the Southwards beyond the Equinoctiall) you must rebate the declination, which is 7. degrees and 15. minutes, and there resteth 43. degrees 15. minutes, for the true height of the

Equinoctial, which ſumme you muſt take out of 90. degrées; that done, remaineth 46. degrées, 45. minutes, the true height of the ſouth Pole aboue the Horizon, otherwiſe called the Antartick Pole, as by enſample of this figure is plainely ſhewed.



An enſample by taking the north pole 60. degrees aboue the Horizon.

Yet furthermore I do think it conuenient to giue you an enſample vnto the Northwards, that you may perfectly know the true order of the working, both for the North part, and alſo the South part. Admit therefore I take the height of the Sunne due South, at 50. degrees aboue the Horizon, the ſunne hauing then North declination 20 degrees: Now (for as much as you haue the North Pole aboue the Horizon) you muſt rebate the ſuns declination from the height: ſo that 20. degrees being taken away from 50. there reſteth 30. which is the height of the Equinoctiall aboue the Horizon, and that 30. being taken from 90. there reſteth 60. So that you may boldly affirm the North Pole to be 60. degrees aboue the horizon, as by this figure following it is ſhewed.



In

In like manner the sunne being taken at that height and due South, hauing the like declination also to southwards that it had before to Northwards: that is to say, being 50. degrees in height, & hauing 20. degrees of declination vnto the south parts, you must adde or put the declination of the sun vnto the height of the same, and it maketh 70. degrees, which is the height of the Equinoctiall aboue the horizon: this done, that 70. being taken out of 90. there remaineth but 20. so that the North Pole is but 20. degrees aboue the Horison, as by the ensample of this figure is shewed.



For by the declination and the height of the Sun, the true height of any of the Poles is knowne. Alwaies hauing this consideration, that if the North Pole be aboue the Horizon, the south declination must be added, or put to the height of the Sunne, but the North declination of the Sunne must be subducted from his height; contrariwise, if the south Pole be aboue the Horizon, you must adde the North declination vnto the height of the Sun, & take away the South declination from the height of the same. Now to know which of the two Poles bee aboue the Horizon, is a very easie matter, and is knowne two waies. For first, if the North Pole be aboue the Horizon, you may know it by all the stars round about the Pole, as Charles waine, and the Guards, with such other marks as be about the North Pole. Neither can you passe so sodainly beyond ỹ Equinoctial, but it must needs be knowne vnto

A thing to be noted in the handling of the sunnes declination.

How to know which of the 2. Poles be vnder the Horizon.

vnto you, and then must vse that kind of working with the suns declination, that in the chapter or rule before is rehearsed: and also you may know it by the Arke or bearing of the starres & lights round about you: for if you turne your face toward the Equator, you shall see the stars ascend from your left hand toward your right, if you be on the Northside of the world: But if you be on the Southside, and turne your face towards the Equinoctiall, you shall see them rise from the right toward the left hand. Thus much haue I said as touching the Sunnes declination, because I know that diuers Englishmen would haue traueled further beyond the Equinoctiall than they haue done, but that they haue not had the capacitie to handle the sunnes declination when they haue been beyond the Equinoctiall, that is to say, vnto the south parts, hauing lost the markes aboue the North Pole, as the North starre and other; and as for the starres of the South, they haue not beene acquainted with them, but haue beaten vp and downe alongst the coast of Ginny and Binney, and there haue spoyled and consumed their men, through the extraordinary heat of the Sunne, not knowing that in going further to the south parts, they should haue brought themselues into a good temperate Climate againe.

The cause why English men haue not trauelled far beyond the Equinoctiall.

Anyotemperate place for extreame heate.

Temperate Climate.

¶ The tenth Chapter sheweth, how to handle the Suns declination vnto the Northwards, where the sunne doth not set vnder the Horizon; and also to take the Sun at the lowest being due North.

FOR further vse of the Sunnes declination, if you haue any occasion to trauell vnto the Northwards or Southwards more than 67. degrees of altitude of any of the two Poles, or if the Sun haue any great declination vnto those parts that you are in, then shal not the Sun go downe vnder the Horizon in a long time after, according as you are in distance more or lesse vnto the North parts; for if you were right vnder eyther of the 2. Poles of ỹ world, then would

Of being vnder either of the Poles.

would not the Sunne go vnder the Horizon in halfe a yeer, so that there should be continually day so long. And now for the handling of the Sunnes declination, to know the height of the Pole, and to take the Sunne North at the lowest, doe this: First with your crosse staffe, obserue the Sunne at the lowest, taking the true distance between the Horizon & the Sunne; that being truly done, loke what declination the Sunne hath: then haue you to consider that except the Sun be nere vnto his greatest declinatiõ, that is to say, in the latter end of Gemini, (or the beginning of Cancer,) the Sunne doth decline little in 24. houres: but if the declination be very swift, you must seeke the Sunnes declination vpon the day before, & the day after, halfe the diuersity of which shall be the Sunnes declination: for that the Sun is at the angle of midnight. The Sunnes true declination being knowne, rebate his height from the declination, and so shall you haue the true content in degrees and minutes, that the Equinoctiall is vnder the Horizon due North; and then pulling that summe from 90. that which remaineth shall be the height of the Pole aboue the Horizon: for as it is before declared, lok what height the Equinoctiall is aboue the Horizon, that is equal to the distance betwæn the Pole and the Zenith; and loke what distance is betwæn the Equinoctiall and the Zenith, the same distance is betwæn the Pole & the Horizon; in like manner, looke how deepe vnder the Horizon the Equinoctiall is vnto the Northwards, so high is the Equinoctiall vnto the Southwards. As for ensample, admit I were vnto the Northwards of the North cape, the Sunne being in his greatest declinatiõ vnto the Northwards, which is about the 11. day of June 23. degrees & neer a halfe: this being known, I take the Sunne due North at the lowest, iust fiue degrees aboue the Horizon, the declination being 23. degrees and 28 minutes. Wherefore I rebate from that, fiue degrees, and so there remaineth 17. degrees & 28. minutes, which expresseth the depth of the Equinoctiall vnder the Horizon, & then do I pul that sum from 90. & there remaineth 72. degrees, 32. minutes,

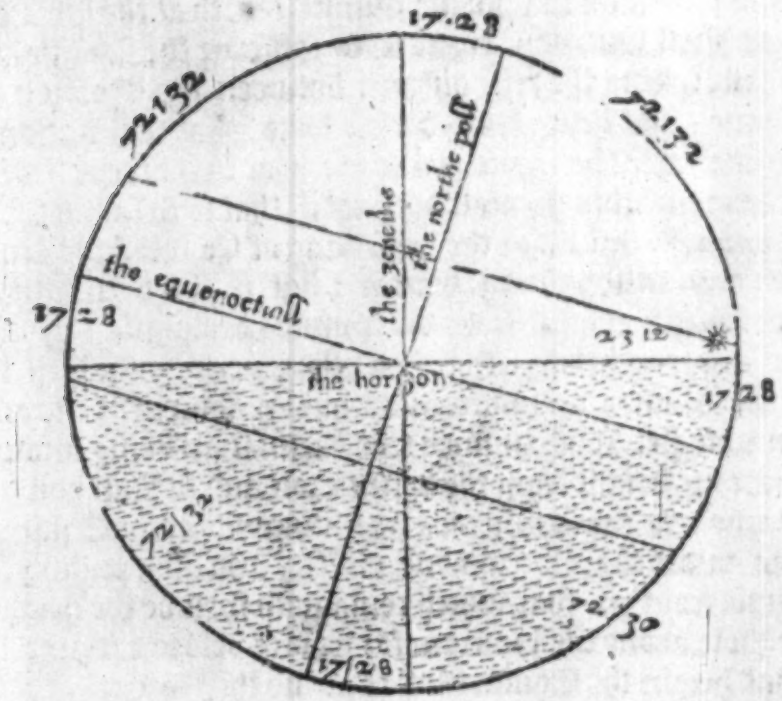
Of taking the height of the Sun due North at the lowest.

A thing worthy to bee noted, touching the Sunnes declination.

A thing to bee noted of the Pole and the Equinoctiall, the Zenith and the Horizon.

The Sunne taken due North at 6. degrees.

nutes, for the true height of the North Pole aboue the Horizon, as by this ensample following is declared.



By this ensample you may also knowe the true height of any of the two Poles, & how to obserue the Sun at the lowest, when the Sunne commeth nereſt vnto the Horizon, as well as you may when the Sunne is in the Meridian at the greateſt height from the Horizon, which is very neceſſary for them that doe occupie vnto the Northwards, as vnto Saint Nicholas in Ruſſia, it is also very neceſſary for them that would attempt any voyages of diſcouery to finde out the paſſages to come vnto Cataie and China, and the Ilands of Moluccas, vnto the Northwards, as into the Eaſt, by Nona Zemla, or to the weſt, by that way that Captaine Frobiſher hath begun to the northwards of Baccalaois, and Labrador. For it is to bee ſuppoſed, that amongſt that broken lands

Of voiages for diſcouery to the Northwards either to the Eaſtward, by Noua Zemla or to

lands and Ilands, that there may be found passage vpon the north part of America, but the great quantitie of Iee may somewhat hinder the prosperitie of that discouery, and yet notwithstanding my opinion is, that it is not frozen there so much to haue such huge quantitie of Iee, but that it may be frozen more farther vnto the North parts, and so by some current or streame brought thither, and so is stayed vpon the coast of Labrador & Baccalaios, by the meanes of the great current that cõmeth out of the Bay of Merico all alongst the northside from Florida vnto Bacalaios, or new found land. the Westward by Cape de Paramantia. Additions.

And yet notwithstanding, it may be possible that if that they did discouer more vnto the northwards, that they should not meete with so much Iee. For at the north cape in Norway, which is much more vnto the Northwards, there is seldome seene any great quantitie of Iee, and yet some ships haue bene beaten off vnto the north of the cape neere 200. leagues, so that they had then neere 80. degrees of height of the North Pole aboue the Horizon, and yet they haue not met with Iee, and it is farther vnto the North parts by 17. degrees, then that place that Frobisher was at.

Wherefore if it were attempted, there is no doubt but they would finde it Nauigable either to the East part, or to the West part: and I am of this opinion, that the thing most feared in making their discouery vnto the Northward, deserueth not so much to be feared as they doe make it: the cause why they are so loth to goe very farre vpon the northwards, is, for that it is the frozen Zone; but my opinion is, that in summer time it is not to be feared, but the farther vnto the northwards, the more temperate warme, by meanes of the long continuance of the Sunne: for as we see by common experience, a thing once being made warme, cannot so dainly be made cold, neither is there doubt of any great cold vntill the Sunne be vnto the Southwards of the Equinoctiall: for I admit that a ship should saile vnto the northward, and not stay vntill the north Pole were eleuated 80. degrees aboue the Horizon, I do thinke that they should find it very temperate Of temperatenesse, the Pole being raised 80. degrees.

temperate and warme, vnto the middle of September, for that by the space of nine weekes together, that is to say, from the 10. of May, vnto the 12. of July, the Sunne should come no nearer vnto the Horizon due North then 10. degrees, and 30. degrees vnto the South part aboue the Horizon; and yet it is possible that it may be cold there vntill the end of May, for that the Sun must haue a time to make the aire warme. For like as a thing once being cold, cannot be sodainly made warme, so in like manner a place being once made warme, cannot be sodainly made cold.

And furthermore, he that were in the Latitude of 80. degrees, should haue but a short Parallel: for the whole Compasse of the earth and the sea going East and West, to come round about to that place againe in the same parallel, is but 1250. English leagues, euery league containing three English miles: So that in sailing of lesse then 500. or 600. leagues, they might see whether it were nauigable or not. For this is one principle, that if that they doe not meet with land, then they shall finde sea, to accomplish the long desired passage to finde out Cattaie.

The length of the parallell. 80 degrees, is but 1250. English leagues.

The xi. Chapter doth shew how you shall knowe the length of the day, and to knowe how much the day is shortned or lengthned by the Sunnes declination.

NOW I thinke it conuenient for sea-faring men to knowe the length of the day in any place that they haue occasion to goe vnto: for that they haue occasion to trauel into al the climates and places, transporting themselues many times quickly from one place to another: & although the ancient writers haue appointed certaine climates, and other late writers in like maner haue made tables very exact for the longest or shortest day in any of those climates and

and other places, according to the eleuation of the Pole: yet haue they not opened any way vnto them, in giuing any order for them to know when the day is an houre longer or shorter, whereby they might at all times know the length of the day; which notwithstanding is very necessary for them, for that they be abroad vnder saile both night & day, and in like manner for that they must keepe an account of houres and times exactly, in as much as they ought to keepe an account of the shippes way: wherefore it must needs bee most necessary for Nauigation, to know the true time of the Sunnes rising and setting, which you shall know by this meanes: First, it is not vnknowne, that vnder the Equinoctiall the Sunne is 12. houres aboue the Horizon, and 12. houres vnder the Horizon, (what declination soeuer the Sunne hath) so that there the Sun riseth at six of the clocke, and setteth at fiue of the clocke for euer.

How necessary it is for a Seafaring man to know the length of the day.

Vnder the Equinoctiall, the day is alwaies 12. houres long.

And where the Pole is raised 16. degrees and 44. minutes, there the longest day is 13. houres, (the Sunne hauing his greatest declination at 23. degrees, 38. minutes) and the shortest day is 11. houres long; and then loke when the Sun hath declined 23. degrees and a halfe either backewards or forwards, for then the day is an houre longer or shorter and proportionably: when the Sunne hath declined 11. degrees, 44. minutes, then it is halfe an houre longer or shorter, &c. Moreouer where the Pole is eleuated 30. degrees, 48. minutes, there the longest day is 14. houres, and the shortest day is 10. houres long, the Sunne then rising at fiue of the clocke, and setting at seauen of the clocke, and there when the Sunne hath declined 11. degrees and 44. minutes from the Equinoctiall, vnto the greatest declination, then the day is an houre longer or shorter, and when the Sunne hath declined fiue degrees 52. minutes, then the day is halfe an houre longer or shorter, &c. Furthermore also where the Pole is rayled forty one degrees 23. minutes, there the longest day is 15. houres, and the shortest, nine houres long, (the Sunne hauing his

The Pole 16. degrees 44. minutes, the day 13. hours long, when it is at the longest.

The Pole 30. degrees 48. minutes, the longest day 14. houres long.

The Pole 41. degrees 23. minutes, the longest day 15. houres long.

his greatest declination, and as then rising at foure of the clocke 30. minutes, and setting at seauen of the clocke 30. minutes,) so that there when the Sunne hath declined seuen degrées 49. minutes from the Equinoctiall, the day shall be an houre longer or shorter, and when it hath declined three degrées 54. minutes, the day shall be halfe an houre longer or shorter, &c. And furthermore, where the Pole is raised 49. degrées one minute, there the longest day is 16. houres, and the shortest eight houres long, the Sunne rising at foure of the clocke, and setting at eight of the clocke: so that there, when the Sunne hath declined fiue degrees, 52. minutes from the Equinoctiall, then shall the day be an houre longer or shorter. And when the Sunne hath declined two degrées 56. minutes, then the day shall be halfe an houre longer or shorter, &c. Yet furthermore, where the Pole is raised 54. degrées 30. minutes, there the longest day is 17. houres, and the shortest seauen houres long, the Sunne then rising at three of the clocke 30. minutes, and setting at 38. minutes: then when the Sunne hath declined foure degrées and 41. minutes from the Equinoctiall, to the greatest declination, the day is an houre longer or shorter, and when he hath declined two degrees 21. minutes, the day is halfe an houre longer or shorter, &c. Where also the Pole is raised 58. degrees 17. minutes, there the longest day is 18. houres long, and the shortest but fiue, and then when the Sunne hath declined three degrees 55. minutes from the Equinoctiall, the day shall be an houre longer or shorter: and when the sunne hath declined two degrees lacking two minutes, then the day shall be halfe an houre longer or shorter. Furthermore also, where the Pole is raised 61. degrees 18. minutes, there the longest day is 19. houres long, and the shortest but fiue houres: then shall the Sunne rise at two of the clocke 30. minutes, and set at 39. minutes; and then when the Sunne hath declined three degrees, and 12. minutes from the Equinoctiall, then shall the day be an houre longer or shorter, &c. Furthermore, where the Pole is raised 63. degrees 22. minutes

The Pole raised 49. degrees one minute, then the longest day is 16. houres long.

The Pole raised 54. degrees 30. minutes, then the longest day is 17: houres long.

The Pole raised 58 degrees, 17 minutes, the longest day is 18. houres long.

The Pole raised 61. degrees, 18. minuts, the longest day is 19. houres long.

nutes there the longest day is 20. houres long, and the shortest but foure houres, then shall the Sunne rise at two of the clocke, and set at 10. of the clock, and when the Sunne hath declined 2. degrees, and 56. minutes from the Equinoctiall vnto the greatest declination, then shall the day be an houre longer or shorter, &c.

The Pole 63. degrees one minute, the longest day 24. houres long.

Now where the Pole is raised 64. degrees 49. minutes, there the longest day shal be 21. houres long, and the shortest but three houres: and then when the Sunne hath declined but two degrees 36. minutes from the Equinoctiall vnto the greatest declination, the day shall be an houre longer or shorter. Where also the Pole is raised 65. degrees, there the longest day shall be 22. houres, and the shortest but two houres long, and when that the Sunne hath declined but two degrees and 20. minutes from the Equinoctiall, then the day shall be an houre longer or shorter. And where the Pole is raised 66. degrees 20. minutes, the longest day shall bee 23. houres long, and the shortest but one houre long, and then when that the Sunne hath declined but two degrees eight minutes, the day shall bee an houre longer or shorter, and where that the North Pole is raised 66. degrees and 32. minutes, there it is 24. houres long, for that when the Sunne hath his greatest declination vnto the Northwards, then at midnight, you shall see halfe the Sunne, and when that the Sunne hath the greatest declination vnto the South parts, then you shall see but halfe the Sunne at noone, and in going but 15. miles further vnto the Northwards, that is, but one quarter of a degree, then the Sun shall bee cleane aboue the Horizon at the due North, & not seene at noone aboue the Horizon, the Sunne hauing his greatest declination to the South, and then the day shall be an houre longer or shorter; when that the Sunne hath declined one degree 57. minutes from the Equinoctiall, and so forth vnto the greatest declination. And thus much haue I saide as touching ỹ length of the day, whereby you may know at all times the true length of the day in any Latitude betweene the Equinoctiall & the

The Pole raised 64. degrees 49. minutes the longest day 21. houres long

The Pole 65. degrees the longest day 22. houres long.

The Pole 66. degrees 20. minutes, the longest day 23. houres long.

The Pole 66. degrees 32. minutes, then the Sunne shall not set vnto them.

The Sunne cleane aboue the Horizon due North, and not to appeare aboue the Horizon, South at noone.

To know the length of the day at any time, in any place: what the day is.

eleuation of the Pole at 66. degrees and 32. minutes, by knowing how many degrees the Sun is declined. And that you may know on euery day by the regiment going before, hauing this consideration, if the Sun be in the Equinoctiall, hauing no declination, then in any Latitude the day is alwaies iust 12. houres long. And you must note this, that it is called the day from the rising of the Sun, vnto the setting of the same vnder the Horizon, and not from day light vnto day light. For before the Sun rise, and after that the Sunne is set, it is counted for no parcell of the day, but it is called the day light. And furthermore, the day light will appeare by that time that the Sun doth touch the 17. degree vnder the Horizon before the Sunne rising, and also the day light will not be cleane gone vntill the Sun be more then 17. degrees vnder the Horizon: as you may perceiue heere with vs at London, that when the Sun hath his greatest declination vnto the Northwards in Iune, the day light remaineth all night, for that the Sunne goeth not vnder the Horizon, but 15. degrees.

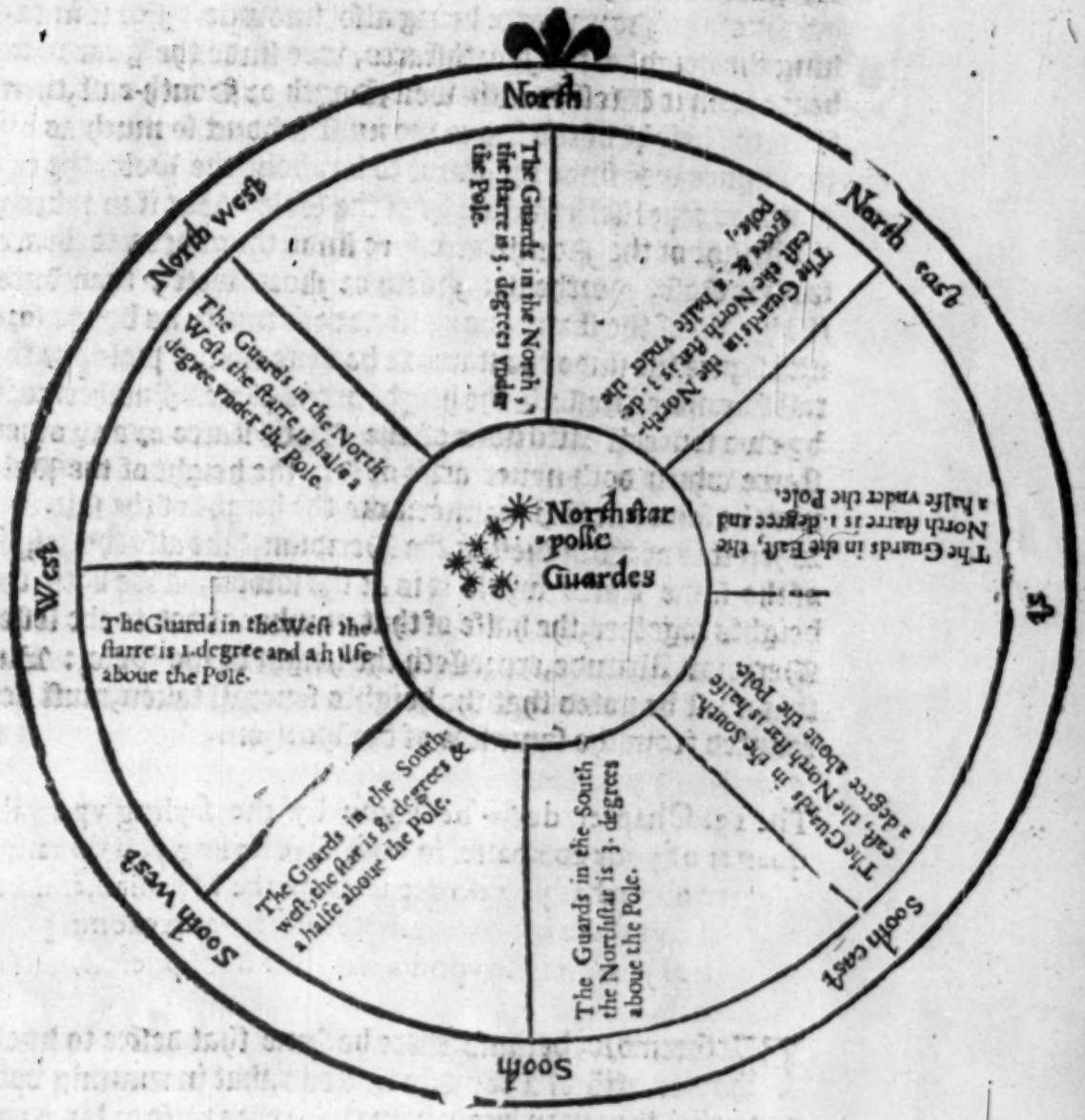
The xii. Chapter is of the North Starre.

AS touching the North star, I say but litle therof, for that is sufficiently declared in the Art of Nauigation, the starre hath Longitude vnto the 21. degrée, 35. minutes of the signe of Gemini, and cõmeth to the Meridian with 3. degrées 45 minutes of Aries. This starre standeth vpon the tipps of the taile of Vrsa minor, or the litle Beare, & hath Latitude from the line Eclipticke 66. degrées, and declination from the Equinoctiall 86. degrees 30 minutes, so that it is distant from the Pole three degrees & 30. minutes. Here note that some of late time making obseruation, affirme that the Pole Starre is but two degrees 52. minutes from the Pole.

The North Starres declination.

Heere followeth the note by the Guards, to knowe whether the North stare be aboue the Pole, or vnder the Pole, and how manny degrees and minutes, &c.

By


North
North east
East
South east
South
South west
West
North west
Northstar
poste
Guardes
The Guards in the North, the starre is 3. degrees vnder the Pole.
The Guards in the North East, the Northstar is 1. degree & a halfe vnder the Pole.
The Guards in the East, the Northstar is 1. degree and a halfe vnder the Pole.
The Guards in the South East, the Northstar is 3. degrees aboue the Pole.
The Guards in the South the Northstar is 3. degrees aboue the Pole.
The Guards in the South West, the starre is 8. degrees & a halfe aboue the Pole.
The Guards in the West the starre is 1. degree and a halfe aboue the Pole.
The Guards in the North West, the starre is halfe a degree vnder the Pole.

By obſeruing of that, which is ſet downe in the former figure we may readily finde the height of the Pole, the height of the Northſtarre being alſo knowne. For if in taking the height of the Northſtarre, wee finde the guards to beare from it Weſt South-weſt, South or South-eaſt, then from the height of the ſtarre we muſt ſubduct ſo much as by this figure wee finde the ſtarre to be aboue the Pole, the remainder expreſſeth the height of the Pole. But if in taking the height of the Northſtarre wee finde the guards to bear from it Eaſt, Northeaſt, North or Northweſt, then vnto the height of the ſtarre, we muſt adde ſo much, as by the former figure we finde the ſtarre to be beneath the Pole, the totall ſumme expreſſeth the height of the Pole. Furthermore by two ſeuerall Altitudes of the North-ſtarre or any other ſtarre which doth neuer ariſe or ſet, the height of the Pole may be found in this manner: take the height of the ſaid ſtar when it is at the higheſt in the Meridian, take alſo the height of the ſame ſtarre when it is at the loweſt, adde both the heights together, the halfe of that number added to the leſſer Meridian Altitude, expreſſeth the height of the Pole: But this muſt be noted that the heights ſeuerall taken, muſt bee counted from the ſame ſide of the Horizon.

The 13. Chapter doth ſhew you by the ſayling vpon the quarter of your compaſſe, in how farre ſayling you do raiſe a degree, and what you do depart from the Meridian, and in the end there is a demonſtration thereof: reckoning it as you do ſaile vpon a flat, but not Spherall.

Furthermore, becauſe there be ſome that deſire to know the alteratiõ of a point, to this end, that in running vpon any point, they may know how much they raiſe or lay ỹ pole ſooner vpon one point then vpon an other, I haue therefore thought good to ſet the matter downe briefely in this Chapter: in going to the North, you doe ariſe the Pole, and lay the Equinoctiall: contrariwiſe, going towards the South, you

In going Southwards you raiſe the Equinoctial & lay the Pole

you lay the Pole, and raise the Equinoctiall. But in sayling or going East or West, you doe neither alter your Pole nor Parallel: but only your Meridian. Whereas in sayling vpon any other point sauing South and North, you doe alter both your Pole and Parallel, and also your Meridian. Wherfore [illegible]oven vnto you (in sayling vpon one of the quarters of [illegible]sse) what distance vpon euery point doth raise or [illegible]e, and how many miles you are distant from [illegible]f that place from whence you departed. But [illegible]g to be noted (as I suppose) in the most part [illegible]llow for euery degree but 17. leagues and a [illegible]ards bee most commonly made in Lishborne, [illegible]n Spaine, or else in Fraunce. But as I take it, [illegible]land would allow 60. miles to one degree, that is, [illegible]t 3. miles to one of our English leagues, wherefore 20. of our English leagues should answere to one degree, for that 3. of our miles will not make one of their leagues, and because they make their accounts by their leagues in the Cards, and not by ours, therefore I will shew you by our English miles. An English mile containeth a thousand paces, and euery pase 5. foote, and euery foote 12. ynches. Now some thinke that a pase cannot be 5. foote, but a pase Geometricall is two reasonable steppes, for it cannot be a pase vntill the hinder foote be remooued forwards, and those two steppes will containe fiue foote, and so may any man endure to goe at pleasure. But now to our purpose. For the sayling of one quarter of the compasse, this is to be noted. First, that in sayling directly South or North, you doe raise or lay the Pole a degree in threescore miles going. In the altering of one point from the South or North in threescore and one miles: and you be departed from the line of the North and South, or the Meridian 12. miles. In altering of the second point you raise a degree in sayling threescore and fiue miles: and depart from your Meridian 25. miles. In altering of the third point, you do raise or lay one degree in sailing threescore and 12. miles, and a 9. part: and are departed from

In going to the Northwards raise the Pole and lay the Equinoctiall.

Of English leagues & Spanish leagues.

A degree is 60. miles, or twenty English leagues.

By obſeruing of that, which is ſet downe in the former figure we may readily finde the height of the Pole, the height of the Northſtarre being alſo knowne. For if in taking the height of the Northſtarre, wee finde the guards to beare from it Weſt South-weſt, South or South-eaſt, then from the height of the ſtarre we muſt ſubduct ſo much as by this figure wee finde the ſtarre to be aboue the Pole, the remainder expreſſeth the height of the Pole. But if in taking the height of the Northſtarre wee finde the guards to beare from it Eaſt, Northeaſt, North or Northweſt, then vnto the height of the ſtarre, we muſt adde ſo much, as by the former figure we finde the ſtarre to be beneath the Pole, the totall ſumme expreſſeth the height of the Pole. Furthermore by two ſeuerall Altitudes of the North-ſtarre or any other ſtarre which doth neuer ariſe or ſet, the height of the Pole may be found in this manner: take the height of the ſaid ſtar when it is at the higheſt in the Meridian, take alſo the height of the ſame ſtarre when it is at the loweſt, adde both the heights together, the halfe of that number added to the leſſer Meridian Altitude, expreſſeth the height of the Pole: But this muſt be noted that the heights ſeuerall taken, muſt bee counted from the ſame ſide of the Horizon.

The 13. Chapter doth ſhew you by the ſayling vpon the quarter of your compaſſe, in how farre ſayling you do raiſe a degree, and what you do depart from the Meridian, and in the end there is a demonſtration thereof: reckoning it as you do ſaile vpon a flat, but not Spherall.

Furthermore, becauſe there be ſome that deſire to know the alteratiõ of a point, to this end, that in running vpon any point, they may know how much they raiſe or lay ẏ pole ſoner vpon one point then vpon an other, I haue therefore thought good to ſet the matter downe briefely in this Chapter: in going to the North, you doe ariſe the Pole, and lay the Equinoctiall: contrariwiſe, going towards the South, you

In going Southwards you raiſe the Equinoctial & lay the Pole

you lay the Pole, and raise the Equinoctiall. But in sayling or going East or West, you doe neither alter your Pole nor Parallel: but only your Meridian. Whereas in sayling vpon any other point sauing South and North, you doe alter both your Pole and Parallel, and also your Meridian. Wherefore I wil open vnto you (in sayling vpon one of the quarters of the Compasse) what distance vpon euery point doth raise or lay one degree, and how many miles you are distant from the Meridian of that place from whence you departed. But here is one thing to be noted (as I suppose) in the most part of Cards they allow for euery degree but 17. leagues and a halfe. Your Cards bee most commonly made in Lishborne, in Portingal, in Spaine, or else in Fraunce. But as I take it, we in England would allow 60. miles to one degree, that is, after 3. miles to one of our English leagues, wherefore 20. of our English leagues should answere to one degree, for that 3. of our miles will not make one of their leagues, and because they make their accounts by their leagues in the Cards, and not by ours, therefore I will shew you by our English miles. An English mile containeth a thousand paces, and euery pase 5. foote, and euery foote 12. ynches. Now some thinke that a pase cannot be 5. foote, but a pase Geometricall is two reasonable steppes, for it cannot be a pase vntill the hinder foote be remooued forwards, and those two steppes will containe fiue foote, and so may any man endure to goe at pleasure. But now to our purpose. For the sayling of one quarter of the compasse, this is to be noted. First, that in sayling directly South or North, you doe raise or lay the Pole a degree in threescore miles going. In the altering of one point from the South or North in threescore and one miles: and you be departed from the line of the North and South, or the Meridian 12. miles. In altering of the second point you raise a degree in sayling threescore and fiue miles: and depart from your Meridian 25. miles. In altering of the third point, you do raise or lay one degree in sailing threescore and 12. miles, and a 9. part: and are departed from

In going to the Northwards raise the Pole and lay the Equinoctiall.

Of English leagues & Spanish leagues.

A degree is 60. miles, or twenty English leagues.

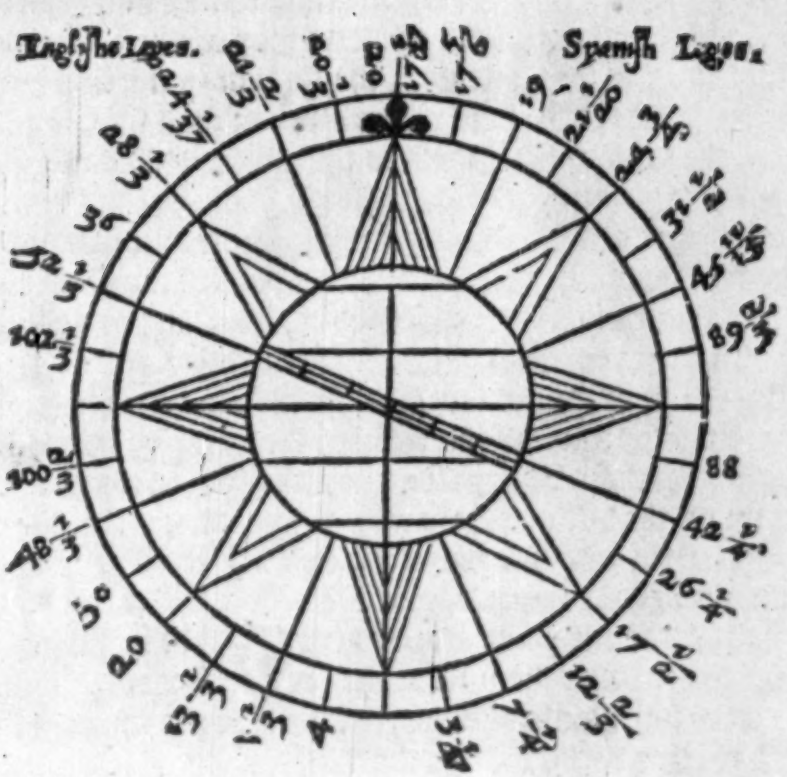
A note to know in how far sayling you doe raise or lay a degree in the sayling by any one point of the Compasse.

your Meridian 40. miles. Moreouer in altering of ỳ fourth point, you do raise or lay a degree in the going of fourescore and fiue miles: and depart from your Meridian threescore miles. In altering of the fift point or winde, you raise a degree in the sayling of 108. miles: and depart from your Meridian fourescore and tenne miles. In sayling by the first point, you raise or lay one degree in 157. miles: and depart from your Meridian line 145. miles. Last of all, in sayling by the seuenth point or winde, you doe raise a degree in going of 308. miles: and depart from your Meridian line 302. miles: and after this manner you may consider of the other three quarters of the Compasse. But if you require to know the rayling or laying a degrée by the leagues of the Cards, that is, at 17. leagues and a halfe: then behold the figure following, or read the Art of Nauigation, & there shall you finde how many degrees you are departed from your Meridian, and also from the place that you departed from: and yet that serueth for none other place but onely for vnder the Equinoctiall, for he that maketh account of it in any other place, shall be deceiued: For euer as you goe to any of the two Poles, your degrees still be shorter and shorter, till such time as your Meridian méeteth vnder the two Poles, whereof I intreat in the fifteenth Chapter.

For the better vnderstanding of the things aforesaid, looke on this figure following. In the which figure you are to note this, that the numbers which are set vpon the vppermost quarter of the circle towards the left hand, expresse the English league, which wee must runne vpon each seuerall point of the Compasse before we can raise or let fal the Pole a degree. The other number on the right hand are the Spanish Leagues seruing to the same purpose. The numbers set on the nethermost quarter of the circle towards the left hand, expresse the distance in English leagues from the Meridian, when we haue raised, or let the Pole fal a degrée,

but

but those on the right hand are the Spanish Leagues, expressing the same distances.



The 14. Chapter teacheth to know how farre any land is off from you, knowing but the distance betweene any two places: whether you run along by the land, or directly to the shore, or otherwise, with other necessary things.

FOR that I know it very necessary and profitable for Sea-men to know how neere or farre they bee into the Sea, and how neere to the land, I will intreate thereof for diuers considerations. And first, because

in running alongſt the land there may be danger, becauſe it may be ſuch a certaine quantitie into the ſea, that they may goe both within & without it. And alſo in like maner, being at one diſtance from ỹ land, the land may riſe in ſuch a ſhape or faſhion, but being nearer, the land may riſe in another forme or faſhion: for being farre off, you ſhall ſee the hilles within the land, and being nære, the hills or cliffes nære vnto the ſea coaſt, may take away the ſight of the land within.

A note for the land, riſing in diuers ſhapes or faſhions.

To know how far the land is from you where two lands be but one point aſunder.

Furthermore alſo it is very neceſſary, to knowe in what faſhion the land doth riſe vpon diuers points of the Compaſſe, as oft as the faſhion of the land doth alter, and to note it in ſome booke for remembrance. Firſt by what points of the Compaſſe, then the faſhion, and laſt, at how farre off, &c. For knowledge how far off you be from the land, you may haue this helpe, if there be any two places by the ſea coaſt, whereof you know the diſtance, how many leagues or miles the one is from the other. In going alongſt the coaſt you ſhall ſet them with your compaſſe, and when you are thwart of them, if they be but one point aſunder, you ſhall be fiue times the diſtance betwæne them from the land or ſhore. If the two places be two points aſunder, thẽ the diſtance vnto the ſhore ſhall bee two times and a halfe the diſtance. If thræ points aſunder, then the diſtance vnto the ſhore ſhall be once the diſtance and a halfe. If foure points aſunder, the ſame diſtance ſhall be betwæn you and the ſhore, that is betwæne the two markes. If fiue points aſunder, then is it vnto the ſhore but two third parts of the diſtance betwæne the two places. If fiue points aſunder, (you being thwart of one of them) then ſhall the diſtance vnto the ſhore be, not halfe the diſtance betweene the two plases. And in all theſe caſes before rehearſed, the one place muſt be thwart of you, the other muſt be a head or ſtearne of you: and ſo it is exact and true. As for enſample this: I going alongſt by ſome coaſt, doe know beforehand one place to beare from another Eaſt and Weſt: beſides this alſo I know the diſtance to be three leagues aſunder. When I haue brought one of the places South or

North

North of me, I doe set them with my Compasse; the one being North of me, and the other bearing North by East, that is one point asunder: Now the distance vnto the shore being fiue times the distance betweene the two places which be three leagues asunder, I know the shore to be 15. leagues from me, which (if the places were but one league asunder) should be but fiue leagues from the shore.

Of two places to be one point asunder.

Furthermore, if the places be two points asunder, that is to say, the one North, and the other North Northeast, then shal the distance vnto the shore be seuen leagues and a halfe from mee. Whereas if the two places were but a league asunder, it should be but two leagues & a halfe vnto the shore. And furthermore, if the places be 3. points asunder, that is to say, the one North, and the other Northeast & by North, the distance vnto the shore shal be foure leagues and a halfe: whereas if the two places were but one league asunder, vnto the shore it should be but a league and a halfe. If 4. points asunder, that is to say, if the one place be due North, and the other place Northeast, then is vnto the shore three leagues iust. If but one league asunder, then but one league vnto the shore. Moreouer if the two places be 5. points asunder, that is to say, the one North, & the other Northeast and by East, then the distance vnto the shore shall bee but two leagues: whereas if the two places were but one league asunder, vnto the shore should be but two miles. Last of all, if the two places be sixe points asunder, that is to say, the one North, & the other East Northeast, then it shall not be a league and a halfe vnto the shore, &c. But if you come directly to the landwards, hauing no cause to be thwart of none of those known places, then to know how farre you bee from the land, you must doe as is by the places before spoken of. For if you goe due North, the one place being North and by West, and the other North and by East, then (the two places being three leagues asunder) you shal be seuen leagues and a halfe from the shore: so that if you run into the shore due North vntill they be foure points asunder, that is to say, the one North

To be two points asunder.

Three points asunder.

Foure points asunder.

Fiue points asunder.

Sixe points asunder.

Of going or saying into the shore.

Northwest,

Northwest, and the other North Northeast, then it shall be vnto the shore three leagues, and three quarters.

And furthermore, you still running in due North till the two places be 6, points asunder, that is to say, the one place to bee Northwest and by North, and the other place to be Northeast and by North, the distance vnto the shore shall be two leagues and a quarter. And againe, if you runne in due North vntill they be eight points asunder, that is to say, the one place Northwest, and the other Northeast: then the distance vnto the land or shore, shal be but halfe the distance betweene the two places, that is, but one league and a halfe. Lastly, if you runne to the land due North, vntill the two places be tenne points asunder, that is to say, the one place Northwest and by West, and the other Northeast and by East, then the distance vnto the shore shall be but one third part of the distance between the two places, that is, but one league from the land, &c. Thus much haue I said as touching the bearing off the land from you, by the points of the Compasse, to know the distance, or how farre the land is off: which is very necessary for Sea-men to know, for diuers considerations, as I said before.

A way to know how one head-land beareth off another.

If now therefore you know not how one head-land doth beare from another, doe thus: in running alongst the coast, when you see the appearing of any land one before another, set them with your Compasses, and looke how they beare from you, by what point of the Compasse, and so shall you know iustly how the one land doth beare or lie from the other. And by this order you may correct your plats, by doing this, as often as you see two notable places together: As Ilands, Rocks, Head-lands, mouthes of Hauens, Sands, or whatsoeuer else be worthy of noting; this done, as often as you do see them together, set them with your Compasse, and that will shew you most certainly, that so they doe beare the one from the other.

To know the distance at sea.

You may know ỹ distance in like manner between them, if you know your ships way, as thus: when you first see any

two

two places together, as two head-lands, or two Ilands, hauing set them with your Compasse, & knowing how the one beareth from the other, then for that you will not come neer vnto them, you do hale off from the land vntil that you haue brought your selfe farre enough off, at your discretion; and when you be thwart of the first head-land, set the other land, & consider how it beareth from you: then reckon your ships way, how many leagues the ship might goe, vntill you come thwart of the other head-land, keeping your course along as the two head-lands beare, and so shall you both know the distance betweene the two places, and also how farre you be off from them. In like manner, hauing consideration of the distance betweene the other places that you haue obserued, both by your Compasse, and also the shippes way, you may know how farre it is to the shore, going right to the land-wards, by your crosse staffe, although you know not the distance betweene any two places.

betweene any two head-lands.

To know how farre it is vnto the land another way.

To know the ships way.

And thus: take the wideneſſe betweene any two places with your crosse staffe, bearing right to land-wards, and then remoue the crosse staffe or Transuersarie, halfe the length of the Transuersary, that is to say, the end nert vnto you; and then by running in, till the two ends of the Transuersary do agree with the two markes, you shall bee halfe way to the shore: then loke how farre the ship hath gone in the time, for the same distance is vnto the land from the ship. But if you remoue the Transuersarie but a quarter the length thereof to you-wards, then at the place where the end of the Transuersary doth agree with the two markes, shall be one quarter of the distance betweene the shore and you at the first obseruation: and it shall be three times the quantitie vnto the shore, &c.

As I doe farther shew the conclusions of the crosse staffe in my booke called The Treasure of Trauailers, the first booke the 10. 11. 12. 13. and 14. Chapters. And to know the shippes way, some doe vse this, which (as I take it) is very good: they haue a peece of wood, and a line to vere out ouer bord

To know the ships way.

bwoy, of a great length, which they make fast at one end, and at the other end, with the middle, they haue a peece of a line, which they make fast with a small thread to stand like vnto a crowfoot: for this purpose, that it should driue a stearne as fast as the ship doeth goe away from it, alwayes hauing the line so ready that it goeth out so fast as the ship goeth.

In like manner they haue either an houre glasse of a minute, or else a knowen part of an houre, by some number of words or such other like, so that ỳ line being vered out, may be stopt iust with the time that the glasse is out, or the number of words spoken, which done, they hale in the logge or peece of wood againe, and looke how many fadame the ship hath gone in that time: that being knowen what part of a league soeuer it be, they multiply the number of fadames, by the portion of time or part of an houre. Whereby you may knowe iustly how many leagues and parts of a league the ship goeth in an houre, &c. As for example this: hauing a minute glasse (but it is better for to haue a portion of time by some number of words, and the lesser part of time that you haue it is the better, for if that the ship doth go very fast, you shall not haue too much line out, and if that the ship doth goe but slowly, then you may double the length of time by speaking the words twice or thrice ouer) let downe your logge handsomely into the water, and then let the line be marked according vnto the ship, a two or three fadame from the log accordingly, that it be so farre a stearne that it commeth into quick water, that the edie of the stearne doth not stay it; that being done, then begin to turne your glasse, or to speake your words, and stay it, iust at the end of the words, and then hale in your logge againe, & measure how many foote or fadames that you haue vered or put out in that time, and suppose that your portiõ of time is 120. parts of an houre, more or lesse it maketh no matter, so ỳ you do know the iust portion of time.

An English league is 2500. fadame.

A Spanish league is 2857. fadame.

Additions.

And suppose that you haue vered 25. fadames in the 120. parts of an houre, therefore multiply 120. by 25. and of that multiplication there commeth 3000. fadame, and now an

English

English league is 2500. fadame, so that the shippe hath gone one league and 500. fadames in an houre, and the saide 500. fadams is the fifth part of a league, so that the ship hath gone one league & one fifth part of a league in an houre. And this by multiplying the portion of time by the number of fadams you may keepe a very good reckoning of your ships way, hauing this consideration, that you doe make as oftentimes prose as the winde doth increase or decrease. Addition.

And for a good order in the keeping your account, do this: Looke how long time that the winde hath blowne steddely without any increasing or decreasing, or altering of your course, then when that you doe see what or how many fadames that the ship hath gone in an houre, multiply the said number of fadams by so many houres as the ship hath gone by the said winde, and then diuide all that sum by 2500. or else it is better to adde al your number of fadams as long as the ship hath gone one course without altering: as for ensample this. The ship hath gone foure houres 25. fadame, in the time of 120. part of an houre, that is in 4. houres 12000. fadame, & the wind encreasing, she went three hours 34. fadames. In 120. part of an houre, that is in 3. houres 12240. fadames, and the wind decreasing, the ship went fiue hours, but 16. fadames, in the 120. part of an houre, that is 9600. fadame in fiue hours; now adde al these numbers of fadams together, that is, 12000. and 12240. and 9600. and all these make 33840. So that the ship hath gone 12. houres 33840. fadames, and now diuide this summe by 2500. which is a league, and then there will stand 13. in the quotient, and 1340. remaineth ouer. So that you may conclude, that the ship hath gone 13. leagues and a halfe, and 90 fadames: and by this meanes you may keep a very good order in your reckoning, and so note it in your booke, and make a marke in your Carte, &c. And this is to be noted, that a Spanish or Portugall league doth containe 2857. fadames, and an English league but 2500. fadames.

The

The xv. Chapter or Rule, teacheth of the Longitude, &c.

NOw some there be that are very inquisitiue to haue a way to get ỳ Longitude, but ỳ is too tedious for Seamen, for that it requireth the deepe knowledge of Astronomy. For this they must consider, that the whole frame of the firmament is carried round from the East to West, in 24 houres, so as there remaineth neyther light nor marke, but goeth round, sauing onely the two Poles of the world, and these two stand alwaies fast. But as I said before in the 9. rule of him that goeth South or North, doth raise or lay the Pole, and in like case the Equinoctial, altering his Parallel, and causing the lights of the firmament to alter the time of their shining or abiding aboue our Horizon: so he that goeth directly East or West, doth neither raise nor lay the Pole; so that still the lights of the firmament doe make one manner of Arch, according to their Latitude or declination: but the going East or West doth alter the Meridian, causing the Planets to haue their aspects at another houre or time, altering the time of the Eclipses: which is necessary for all trauellers by sea or by land to know. Therfore I thought it needfull to be spoken of: for as countries haue Latitude from the Pole, so in like maner they haue an appointed Lõgitude, you may get the Latitude with instruments, but the Longitude you must bring from another place, which you cannot do but with a Globe or else a Map or Card, & then you must measure frõ the Meridian of the Canary Ilands, otherwise called the fortunate Ilands. And in our Latitude of London, euery 555. miles which containeth 15. degrees. will answere to one houre of time: and vnder the Equinoctiall 900. miles to 15. degrees: the degrees of Longitude vnder

Altering the time of rising and setting of the lights.

Altering the aspects.

Of Latitude & Longitude.

15. degree is an houre of time, and at London it is 555. miles.

vnder the Equinoctial, be as long as the degrées of Latitude, but towards the Pole they are lesser and lesser, they come to nothing vnder the two Poles; with vs at London 37. miles will answere to one degree of Latitude, the Pole being raised betweene 51. and 52. degrees. The cause why the Longitude was fetcht from the Canarie Ilands, I know not, but it was as I suppose, because it was the westermost place then knowne: for Ptolomeus was the first that ordained that rule.

Longitude begioneth at the Canary Ilands.

Now furthermore, because you shall know this thing the better, I haue set forth in my 2. book, called the Treasure for trauallers, certaine principal places in the whole world, both according to their Longitude & Latitude, whereby you may knowe what manner of Arch the Sun with the other lights doth make, & also by the Longitude, you may know at what time the Moone doth make an aspect with any of the Planets. Besides this, you may know the Eclipses of the Sun or Moone, with the change quarters, and full Moone in all places at the very true houre and minute of time of the Diameter. If you haue a true, and an exact Ephemerides, & consider diligently for what Longitude or place your Ephemerides was made. The Longitude may be found at the time of the Eclipses of the Moone, so that the be aboue your Horizon in any place vpon the superficies of the earth, or sea in this manner.

To know the true time of the aspect of the Moone.

Seeke out in the Ephemerides, the time of the Eclipse, obserue also diligently the iust time, wherein you see the Moone Eclipsed, compare the saide time with the time set downe in the Ephemerides, if they doe both agree, then are you in the same Longitude, and vnder the Meridian of that same place for the which your Ephemerides was made. But if the two times compared together doe differ, then are you either to the East or Westward of that place, for the which your Ephemerides was made. If the time wherein you obserued the Eclipse be lesser then that, which is set downe in the Ephmerides; then are you to the Westward, but if it bee greater,

greater, then are you to the eastward of that place, for which your Ephemerides was made. How much you are to the east or Westward may easily bee knowen by the difference of time, and the degrees of Longitude answerable thereunto. Unto euery houre there are ascribed 15. degrees, to euery halfe houre seuen degrees & a halfe, & so consequently following that rate as the difference of time is more or lesse. If the time noted in the Ephemerides doth differ an houre from the time of your obseruation, then doth the place wherein you obserued the Eclips differ in longitude from the place, for the which the Ephemerides was made, 15. degrees; if two houres then is the difference of Longitude 30. degrees, &c. These degrees answerable to the difference of time, and expressing the difference of Longitude must be subducted if your obseruation of the Eclips were made to the westward, otherwise they must be added to ẏ longitude of the place, for the which the Ephemerides was made, so shall you finde the true Longitude of the place in the which your obseruation was made.

And furthermore you might know your Longitude with the Ephemerides, by the coniunction of the Mone with other fixed starres, if it were not for one great infirmitie, and that is the paralley of the Mone, which the semi-diameter of the earth doth cause, by nearnes of the mone vnto the earth: wherefore I would not haue any man thinke that the Longitude is to be found at Sea by instrument. Therefore let no Sea-men trouble themselues with any such rule, but (according to their accustomed manner) let them kepe a perfect account and reckoning of the way of their ship, whether the ship goeth to leewards, or maketh her way good, considering alwaies what things be against them or with them, as tides, currents, winds, or such like.

The Longitude is not to bee gotten with instruments on the Sea.

The

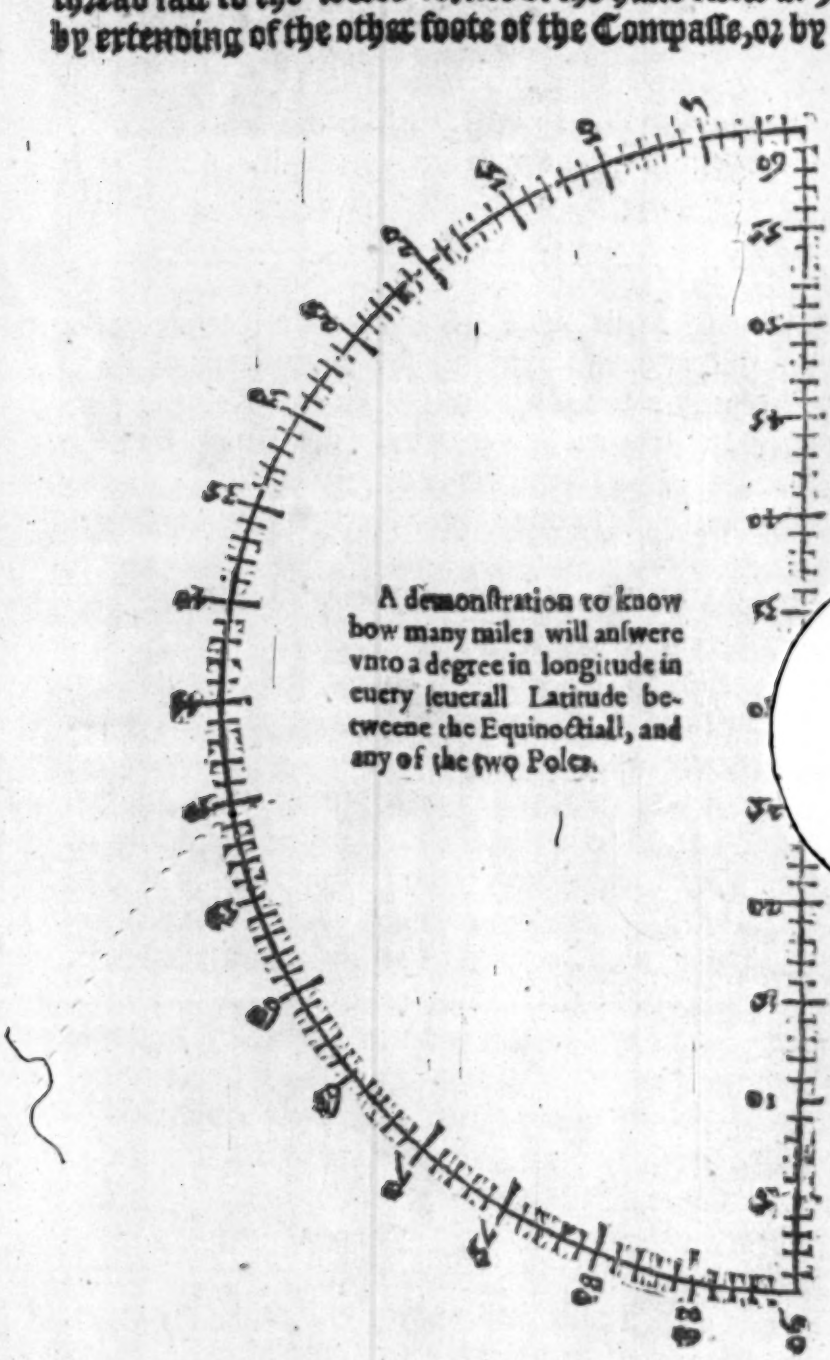
The xvj. Chapter sheweth how many miles will answere to one degree of Longitude, in euery seuerall Latitude, betweene the Equinoctiall and any of the two Poles: with the demonstration for that purpose, and the diuersitie of aspects of the Moone.

NOW by this rule shall I teach you how many miles will answere to one degree, for euery seuerall Latitude, betweene the Equinoctiall and any of the two Poles either Arcticke or Antarcticke. And first vnder the Equinoctiall, (the two Poles being euen with the Horizon) 60. miles doe answere to one degree, as I saide in the 15. Chapter.

And now shall follow the rest. Where the Poles be raised 21. degrees 56. miles belongeth to one degree of Longitude. Now the Poles being raised 29. degrees 52. miles doe answere to one degree. The Pole being raised 36. degrees 48. miles doe adswere to one degree.

The Pole 42. degrees raised 44. miles goeth to one degree of Longitude. The Pole raised 48. degrees 40. miles to one degree. The Pole raised 53. degrees 36. miles to one degree. The Pole raised 57. degrees 32. miles to one degree. The Pole raised 52. degrees 28. miles to one degree. The Pole raised 66. degrees 24. miles to one degree. The Pole raised 70. degrees 20. miles to one degree. The Pole raised 74. degrees 16. miles to one degree. The Pole raised 78. degrees 12. miles to one degree. The Pole raised 82. degrees 8. miles to one degree. The Pole raised 86. degrees 4. miles to one degree. The Pole being raised to the highest at 90. degrees (being then your Zenith) there al the Meridians meete. And now shall follow a demonstratiõ of halfe a circle, that shall shew you how many miles will make a degree, according vnto euery latitude that you are in, by the applying of the one foote of a paire of Compasses, or by making a

thread fast to the lower corner of the halfe circle at 90. and by extending of the other foote of the Compasse, or by laying



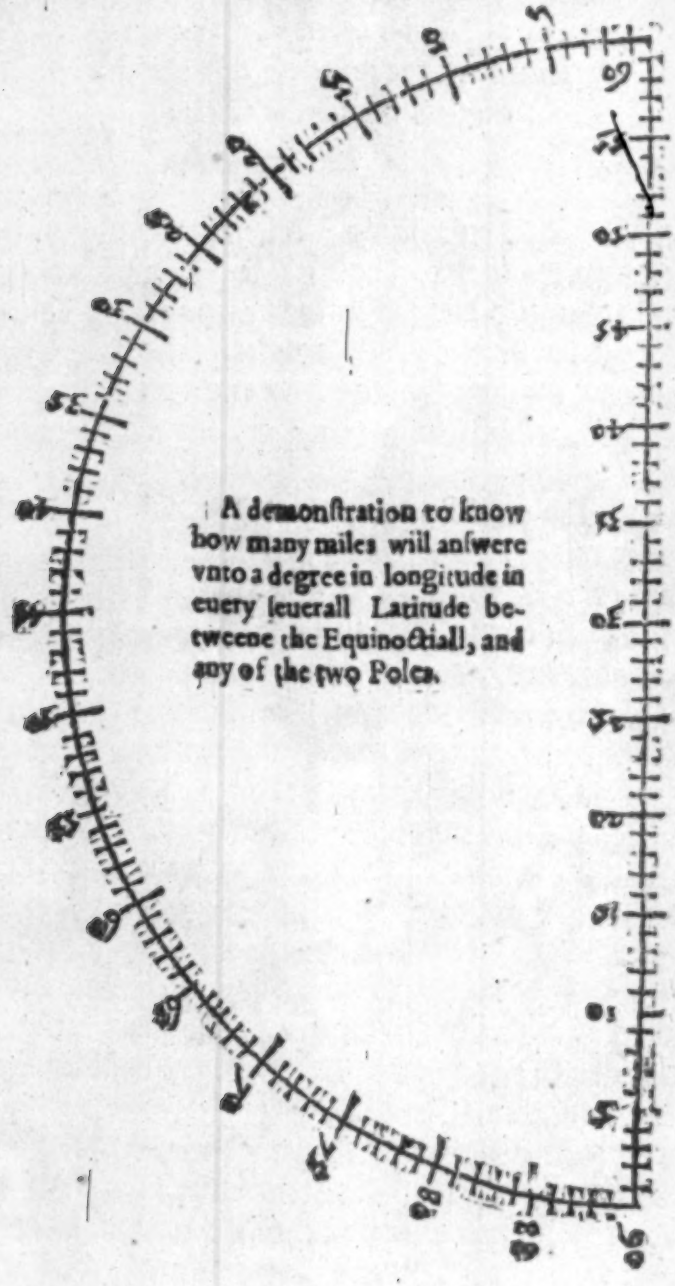
A demonstration to know how many miles will answere vnto a degree in longitude in euery seuerall Latitude betweene the Equinoctiall, and any of the two Poles.

the

the thread vpon the latitude of the place wherein you are, the which Latitude or eleuation of the Pole is marked by seuerall degrees in the halfe circle, and in the Diameter are marked the miles answering to euery degree. Your compasses therefore being extended, or the thread being applied from 90. to the Latitude of the place wherein you are, turne the Compasses or the thread downward to the Diameter; for the number vpon which the foot of the Compasse, or the end of the thread lighteth, expresseth the miles answerable to each degree of Latitude in the Parallel of the Latitude propounded. The reason is this, because al circles be in proportion correspondent vnto their Diameters. Now you must consider (as it was partly noted before) that vnto euery houre of time in the changing of the Moone or of the Eclipses, you must allow 15. degrees, and vnto euery degree you must allow so many miles as you doe see in your former instrument to be answerable to the latitude of the country, in ... manner: those places that be to the Westward of your ... place, or countrey, by 15. degrees, the Moone shall ... change rather with them then with you by one houre, be... that they shall touch your Meridian before theirs by ... houre. And if the town or place be to the Eastwards of you by 15. degrees, then shall the Moone change rather with you than with them by one houre, as for ensample thus. If so be that with vs at London the Moone shall change vpon any day at 12. of the clocke at noone, 5. minuts to the Westwards as farre as Lisbborne in Portugall, the Moone shall change that same day at 11. of the clocke 43. minutes, the Longitude being thereof from the Canarie Ilands fiue degrees, 36. minutes. Now to the Eastwards, the same day at Roume the Moone shall change at two of the clocke, 31. min. because that they haue Longitude 36. degrees, 40. minutes from the Canarie Ilands; & then by this account 7. degrees and a halfe will answer to halfe an houre, and then three degrees & three quarters will make a quarter of an houre, and then nine miles and a quarter wil make one minute of time

15. degrees answereth vnto an houre of time.

thread fast to the lower corner of the halfe circle at 90. and by extending of the other foote of the Compasse, or by laying



A demonstration to know how many miles will answere vnto a degree in longitude in euery seuerall Latitude betweene the Equinoctiall, and any of the two Poles.

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the thread vpon the latitude of the place wherein you are, the which Latitude or eleuation of the Pole is marked by seuerall degrees in the halfe circle, and in the Diameter are marked the miles answering to euery degree. Your compasses therefore being extended, or the thread being applied from 90. to the Latitude of the place wherein you are, turne the Compasses or the thread downward to the Diameter; for the number vpon which the foot of the Compasse, or the end of the thread lighteth, expresseth the miles answerable to each degree of Latitude in the Parallel of the Latitude propounded. The reason is this, because al circles be in proportion correspondent vnto their Diameters. Now you must consider (as it was partly noted before) that vnto euery houre of time in the changing of the Moone or of the Eclipses, you must allow 15. degrees, and vnto euery degree you must allow so many miles as you doe see in your former instrument to be answerable to the latitude of the country, in this manner: those places that be to the Westward of your towne, place, or country, by 15. degrees, the Moone shall change rather with them then with you by one houre, because that they shall touch your Meridian before theirs by one houre. And if the town or place be to the Eastwards of you by 15. degrees, then shall the Moone change rather with you than with them by one houre, as for ensample thus. If so be that with vs at London the Moone shall change vpon any day at 12. of the clocke at noone, 5. minuts to the Westwards as farre as Lisshborne in Portugall, the Moone shall change that same day at 11. of the clocke 43. minutes, the Longitude being thereof from the Canarie Ilands fiue degrees, 36. minutes. Now to the Eastwards, the same day at Rome the Moone shall change at two of the clocke, 31. min. because that they haue Longitude 36. degrees, 40. minutes from the Canarie Ilands; & then by this account 7. degrees and a halfe will answer to halfe an houre, and then three degrees & three quarters will make a quarter of an houre, and then nine miles and a quarter wil make one minute of time

15. degrees answereth vnto an houre of time.

with vs at London in our latitude, so by this rule you may know at what time and minute the Eclipses or changes of the Moone doe happen, knowing for what place your Almanake was made, as commonly we here in England do make them for the City of London.

Thus much haue I said as touching the true time of the change of the Moone, for that some people (as I haue said before in the third Chapter) do contemptuously say, why do they not giue or make rules for euer, to know the houre and minute of the change, full, and quarters of the Moone? And yet they be vtterly void of any knowledge in the Mathematicall science, whereby they might know the true time of the change of the Moone: For it is a question Astronomicall, to knowe the Moones motion: a question Geometricall, to know the true time of the aspects, or measure betweene the Sunne and the Moone: and thirdly, it is a question Cosmographicall, to know the true Longitude of the place he is in, at the time when the Moone changeth, &c.

To know the true time of the change & quarters of the Moone, is a question Astronomicall, Geometricall, and Cosmographicall.

Now followeth the next rule which shall treat of Longitude and Latitude.

The seuenteenth Chapter sheweth the Circumference of the whole Earth and the Sea, vnder sundrie Paralels, whereby that any Sea-man may know what quantitie or part of the earth that hee hath sayled, or passed, by the number of leagues, and also he may know the alteration of time, &c.

Additions.

AND now furthermore I doe thinke it necessarie for to shew the Circumference of the whole earth, in sundry Latitudes from the Equinoctiall, wherby in sayling, you may know what quantity or part of the whole earth you haue passed or gone, and also what the diuersitie, aspect, or time

is wherein you haue transported your selfe from a place assigned, which is necessary for them that should goe any long voyage.

Under the Equinoctiall the whole earth is in circumference 7206. leagues, attributing 20. leagues to a degree, and the halfe thereof is 3603. leagues. In that Parallel it is mid-night to one, when it is high noone to another, and the quarter of a Compasse is 1800. leagues, and there the diuersitie of time is altered fiue houres, and then in 900. leagues the time is altered three houres: so that in the sayling East or West vnder the Equinoctiall, three hundred leagues shall alter one houre of time in the Eclipses or the changes of the Moone, &c.

Furthermore, where the Pole is raised 20. degrees aboue the Horizon round about the earth keeping the Parallel, the whole compasse is 6766. leagues, and the halfe of it is 3383 leagues, and there your noone is midnight, and then a quarter of that Parallel is 1691. leagues and a halfe, and there the alteration of time is fiue houres, and then 846. leagues doth alter three houres of time, so that 282. leagues doth alter one houre, in the change or Eclipses of the Moone, &c.

In the Latitude of 30. degrees from the Equinoctiall, the compasse of the earth vnder that parallel is is 6236. leagues. and the opposite part in that parallel is 3118. leagues, and there noone is midnight, and then the quarter of the Compasse of the earth is 1559. leagues, and then passing in that Parallel 779. leagues and a halfe, doth alter three houres of time: so that 260. wanting $\frac{1}{3}$ leagues, shall alter one houre in the aspects of the moone, and also in the Latitude of 40. degrees from the Equinoctiall, the whole compasse of the earth and sea vnder that Parallel is 5516. leagues: So the halfe is 2758. leagues, and a quarter is 1379. leagues, so that 689. leagues and a halfe, shall alter three houres of time, & 230. leagues, wil alter one houre of time in the eclipses or aspects of the Moone, &c.

Where the Pole is raised 50. degrees, there the circum-

ference of the whole earth vnder the Parallel is 4628. leagues, and a halfe thereof is 2314. leagues, and the quarter thereof is 1157. leagues: so that 578. leagues and a halfe, doth alter three houres of time: and 193. leagues doth alter one houre of time in that Parallel. In the Latitude of 60. degrees from the Equinoctial in that parallel, it is but 3600. leagues, to goe round about the whole earth and sea, so that 1800. leagues is the opposite part of that Parallel, and there your noone is midnight; so that 900. leagues shall alter fiue houres of time, and 450. leagues, three houres of time, and 150. leagues shal alter one houre of time in the aspects of the moone, being the 24. part of the compasse of the earth, in that Parallel, &c.

Where that the Pole is raised 65. degrees, there the circumference in the Parallel is 3042. leagues, so that the halfe is 1521. leagues, and a quarter of that Parallel is but 760. leagues and a halfe: So that 380. leagues shall alter three houres of time, and 126. leagues and $\frac{1}{3}$ shall alter one houre of time, &c.

And also in the Latitude of 70. degrees, the Compasse of the earth is in the Parallel 2492. leagues, so that the opposite part is 1231. leagues, & the quarter is 616. leagues and a halfe, so that 307. leagues and three quarters, doth alter three houres of time, and 102. leagues will alter one houre in the Eclipses or change of the Moone. And furthermore, in the Altitude of the Pole 75. degrees, there the compasse of the earth in that Parallel, is 1864. leagues, and the halfe is 932. leagues, and the quarter is 466. leagues; so that the alteration of three houres of time is 233. leagues, & 77. leagues, & 2. miles will alter an houre of time, &c. And also in the Latitude of eighty degrees from the Equinoctiall, there the whole circumference of the earth vnder that Parallel is but 1250. leagues. And the opposite part in that parallel is 625. Leagues, and then the quarter of that, is but 300. & 12. Leagues and a halfe, so that 156. Leagues will alter three houres of time, and fiue and twenty leagues will alter one houre,

houre, in the time of any Eclipse or any aspects of the Moon, so that you may see how short that the Circumference of the earth is at the Latitude of eightie degrees: and this I doe cease to shew any further towards the Pole-wards, for that it is doubtfull whether that it is Nauigable so neere vnto the Poles, &c.

The eighteenth Chapter or rule, sheweth how to sayle by the Globe.

NOW to sayle by the Globe, it is conuenient to bee spoken of: For that generally the most part of the Sea-men make their account as though the earth were a flat forme: for they do not consider that the earth is a Globe, and that the Meridians doe grow narrower and narrower towards the poles, for it is vnpossible to draw the face of the earth and the Sea true vpon a platforme, for if you will describe the land true, then shall not the Sea be true if your lines be made according to the Art of Hydrography, for the Sea shall be broader to the North parts then it is, because the Meridians grow together. Now and if you would describe the sea true, with lines, courses, distances, hauens, and dangers, then should your land bee broder to the North parts then it is. As for ensample thus: England and Scotland being both one Iland, in all your Cardes of Nauigation, that doth shew any part to the Southwards, the North part of Scotland is drawne much bigger then it is, for otherwise the lines of South and North should not be according to the trenting of the land, for if you view it well, you shall find the North end of Scotland much more in distance then it is. As you may see in measuring it by the truncke of your carde.

You cannot draw the land & Sea true vpon a flatting.

To make a sea-plat or Card.

For your better vnderstanding, I haue shewed the compasse of the earth vnder sundry Latitudes in the Chapter going before, and by that you may see that the compasse of the East and West line (comming from the Equinoctiall)

is much lesser to the Northwards, then it is to the Southwards. Wherefore when you shall haue any occasion to attempt any voyage to the North parts, it is best to sayle by a Globe, for so shall you better see the distance and bignesse of the lands, and in like manner your lines & courses. In this order, first (according to the accustomed manner) keepe a perfect account and reckoning of the way of the Ship, by what line or point your Ship hath made her way good, then must you resort to your globe: after that consider what place and parallel you be in, which you may doe by the Sunne by day, and by the Starres by night. Now (knowing what place & Parallell you be in) set your Globe to the eleuation of your Pole: that done, turne to the place of your Zenith, and seeke the opposite of it in your Parallel: for then you know that in the same Parallel is your East and West line: that had, the iust quarter of that circle to the Pole, must bee diuided into the eight points of your compasse, doing so likewise on the other side.

How to vse the Globe to direct your course, & to know how that any place doth beare.

In like case if you come to the Southwards, diuide your eight windes from your Antarcticke Pole, to your Parallel circle: and thus must you doe euer & anon, for the oftner you doe obserue this custome, the better and perfecter shall your course be. Now thus briefely I make an end of the sayling by the Globe. But for them that do occupy the South parts, nothing is better then their cards. Because I haue declared vnto you ỹ length of certaine of the parallels, what leagues the earth doth containe in compasse vnder them, now wil I shew you how many leagues distance there is, from one parallel vnto another, accordingly as I haue set downe in the chapter next going before this, where I do shew the circumference first vnder the Equinoctiall, and then the latitude of twenty degrees, and then 30. degrees, &c. First from the Equinoctiall vnto the latitude of twenty degrees is 400. leagues, and from 20. degrees vnto 30. degrees in latitude, is 200. leagues. The like is from 30 vnto 40 degrees, and from 40 to 50, and from 50. to 60. So that there is from

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the Latitude of 60. degrees vnto the Equinoctiall 1200. leagues, & there a degree of Longitude is but halfe so much as it is vnder the Equinoctiall, and the whole circumference of the earth but halfe so much; in like manner from the Latitude of 60. degrees vnto the Pole is but 600. leagues, and there all the Meridians doe meete: and it is from the Equinoctiall vnto either of the two Poles of the world 1800. leagues, &c. which is the fourth part of the Compasse of the whole earth.

The cause why that you may see the sailes of a ship, and not the hold.

Furthermore, for that you may the better vnderstand, that the earth is a Globe or circular (which any person that doth occupie the Sea, seeth most apparently) you shall perceiue it thus: if you see a ship any thing farre off, you may perfectly see the saile of it, but not the hold, the cause whereof, is the circularnes of the earth, and the water of the Sea: for that the water doth arise and swell betweene you and the other ship, according to the distance betweene both the ships, because the distance to the Center of the Earth or Water, is in euery place alike. And hee that hath desire to know further hereof, M. Dee hath made mention thereof in Euclides Elements, in his Mathematicall preface, and also in the twelfth booke, whither you may haue recourse: yet notwithstanding I wil say a litle thereof, whereby you may discerne how farre it is possible to see a ship vpon the sea: if you be on the sea in a ship, so that there be but halfe a league betweene you & the other ship, the water will be fiue ynches and a halfe higher in the middle of the way betweene both the ships; for that the water is of equall distance in euery place from the center of the earth, and runneth in a crooked line, the which crooked line being subtended by a right line, the middlemost line betweene two shippes that commeth from the center of the earth, shall bee shorter then the other two lines comming from the center of the earth, vnto the two shippes, by fiue ynches and a halfe; then it must needes be said, that the water is higher by the saide fiue ynches, and a halfe. And furthermore if the two Shippes were a league

asunder

asunder, then the water by his circularnesse should be 22. inches higher than the leuell in the middle betweene both the Shippes.

To know how many foot and ynches the water is higher than the leuell or the Sea, betweene two ships.

Furthermore, if the two Ships be two leagues asunder, then the water shall be higher than the leuell in the middle betweene both the ships, by 88. ynches, which is seuen foote and foure ynches. If the two ships be three leagues the one from the other, then the water shall be higher then the leuell in the mid-way betweene both the Ships by 198 ynches, which is 16 foot and a halfe.

Furthermore, if the two ships be foure leagues asunder, the water shall be higher than the leuell in the mid-way betweene both the ships, by 252. ynches, which is 29 foote and foure ynches. And furthermore, if the two ships were fiue leagues asunder, the water should be higher then the leuel of the mid-way between both the ships, by 550. ynches, which is 46 foot, lacking two ynches. Yet furthermore, if the 2. ships were 6. leagues asunder, the water should be higher than the leuel in the middle way betweén them by 792 inches, which is 66. foote. Furthermore also, if the two ships were seuen leagues asunder, the water should be higher then the leuel in the midway betweene both the ships by 1878. ynches, and that is 90. foot, which is as farre and rather farther than it is possible to see any ship vpon the Sea: Neither is it possible to see any land further, but such land as is very high land, which for the greatnesse of the height may be seene, wherefore fiue leagues or seuen leagues is called a kenne.

What a kenne is. The cause why you may see a ship farther out of the top than vpon the hatches.

Now the circularnesse of the earth is the cause why you may see a ship or land further out of the top, than vpon the hatches: wherefore it is a plaine case, that the earth and sea is not flat, but circular, as is afore declared, &c.

The xix. Chapter, is as touching the making of Plats or Cards for the Sea, and not to paint their Cardes as they doe, but rather to supply the vacant places with other necessarie matters: and also of three necessarie things contained in the Plats or Cards, and their vses, which is the most necessary thing in Nauigation.

FOR the making of Plats or Cards, as touching Hydrographie, commonly called sea Cards: I meane to say little thereof: for that it is sufficiently declared in the booke called the Art of Nauigation: sauing this, I would wish them that be makers of Plats & Cards for the Sea, not to paint their compasses with so many colours: neither vpon the land with so many flags, for that it doth rather hurt then good: although it may be saide, they be so painted in vacant places; those vacant places I would wish them to furnish with these two matters, in this order. First, in some vacant place to make a Compasse, & to place against euery point of the halfe of the compasse, letters or some of the figures or Characters, and in like maner, to make the letter or Character at the hauen, port, or place where the Moone maketh a full sea, being vpon that point of the compasse, vpon which the said letter or character doth stand; as for ensample thus: I place A. at the East point, B. at the East & by South, C. at the East South-east, D. at Southeast & by East, and so consequenly to all the points vnto the West; then that being done, where it floweth at East moone, I place A. in the Plat or Card, and where an East and by South moone, I place B. in the Card, and so forth, according to the place of the moone that maketh a full sea. And where it runneth halfe tide vnder other, to make some note vpon the Card in that place, &c.

Not to paint their sea cards but to vse the vacant places with other necessary matter.

This also is very necessary to be done, to furnish vp all the vacant places of the Plat or Card, to draw the shape or fashion of euery head-land or high-land alongst euery coast. that

To draw the shape of the land in their Cardes.

that is needfull to be knowen, and at what point of the compasse the land is of that fashion: at how farre off the land riseth in that fashion: & so to make a fashion of the land as often as the land altereth the forme and fashion: & last of all, at what point of the compasse the land hath that shape or fashion: for being vpon one side, the land riseth of one fashion, and on the other side of another forme or fashion.

And being neer the land, it will be in one fashion, and being farre off in another fashion (as is before declared in the 14. Chapter) for there is nothing more needfull and necessary for the Sea-men then this, to knowe the land when hee seeth it, and there is no way better to make him remember it, then to haue notes how the land doeth rise vpon euery side, and what greater inconuenience may there grow by any meanes, then there may bee by mistaking of a place: for it were twenty times better to be throughly perswaded, that he knoweth it not, then to thinke he doth knowe it, not being that place. For whereas he doth thinke to preuent the dangers, hee may willingly runne vpon the dangers, not known of him. Therefore in my opinion they can do no better then to furnish their vacant places in their Plats and Cards with this matter. The vse of the Sea Cards is most necessary for Nauigation for long voyages: first, for that it sheweth you how one place beareth from another: secondly, the distance of any place how farre the one is from the other: Of which the one is represented by the lines of the compasse: the other by the scale or truncke of measure, if the Plat bee truely made: thirdly, it sheweth you in what Latitude from the Equinoctiall or Altitude of the Pole any place is in, by the line of degrees.

Great inconueniencies by mistaking any place.

How necessary a thing the Sea Cards be.

Three necessary things in the Sea Cards.

Now to direct your course through the sea by your Card, to any place assigned, you must first lok by what point of the compasse it beareth from you, frō the place you meane to set off from the land, vnto the place you would first fall with. Which you shall know thus: take a line from the next compasse, vnto the place you meane to depart from, thē open your

To know how any place doth beare from you by the Card.

Compasses

Compalles vnto one of those lines by your iudgement that falleth neere vnto your place assigned: and let the other foot of your Compalles stand iust at that place where your Ship is, when you direct your course: that done, beare your hands forwards euen, & let the one end be still vpon the line to the which you did open your Compalles, vntil you come to your place assigned. But if it falleth short of the place assigned, then take the next line nearer vnto the place you departed from: when you haue so done, if your Compalles doe ouerreach the place assigned, then take a line further off from the place you doe meane to set off from: and so shall you see by what point of the Compalle the place assigned doth beare from you, &c. If you would know how far the place assigned is from you, set the one fote of the compalles vpon the place you depart from, and stretch out the other fot vnto the place assigned iust; that done (keeping your compalles at that extent) set them to the scale or trunke of measure, and that wil shew you iustly how many leagues it is from the place of your departing vnto the place assigned. If the distance betweene the two places be more than the compalles wil reach at once, then first set your compalle vnto the scale, opening the compalles vnto 100. leagues more or lesse, as your scale and compalles will giue you leaue at your discretion; after that, set the one foot at the place of your departing, and the other fote of ỹ Compalles right towards the place assigned, as oftentimes as the distance betweene the two places doth require, and then (the compalles being opened vnto 100. leagues) you may conclude it to be so many hundred leagues vnto the place assigned, as the compalles did shew vnto you: but if there be any odde measure, then open your compalles to that quantity, and set that to the scale, and it will shew you the iust content of that measure, more than so many hundred leagues, &c. Furthermore, touching the third commodity, which is to know what Latitude any place assigned hath: set one fote of the compalles vnto the place assigned, and open the compalles vnto the next East and West line; then

To know how farre it is vnto any place by the Carde.

To know what latitude or height of the Pole any place hath by the Carde.

then carrie that vnto the line of Degree, keeping the foote of the Compasses vnto the East and West line, it will shew iustly the number of degrees that the Pole is aboue the Horizon.

So of these three waies, by the first is knowen by what point of the Compasse any place beareth from you. By the second is knowen how farre distance it is vnto any place assigned. And by the third is knowen in what height the Pole is, in any place assigned, &c. Now this beeing knowen, you may with the more ease know how to attaine to come vnto the Port or place assigned.

Yet furthermore there is to bee considered (in directing the course of a Shippe to any place assigned) what impediments may be by the way: as tides, currents, or the scantnesse of the winde, which may put the Shippe vnto the leewards of his course, as also the surging of the Sea: and all this must be considered by the Master and Pilot of the ship. Likewise also in long voyages, the winde may often shift vpon him, and sometime the wind may be such as he cannot lye his course: wherefore he must keepe a perfect account of the Shippes way, and consider what point the Shippe hath made her way good by. And at euery time that the winde doth shift, and the Ship cannot lye her course, to note in the Card or Plat in what place the Ship may be: in hauing a speciall regard vnto the way of the Ship, as touching the swiftnes or slownes that the Ship goeth. And if so be the weather be cleare eyther by night or day, to take the true Altitude of the Pole: for by that they may correct the Ships way, and giue a very neere gesse, how the place (assigned to goe vnto) doth beare from them, as also how farre it is thither, sauing only in the East and West course, and then they haue no other helpe but onely the very account of the Ships way.

Things to be considered by the Master or Pilot of a ship.

They may correct the Ships way by the taking the height of the Pole.

And to correct their dead reckoning by the Altitude of the Pole, they must doe this: especially if the Ship haue had often trauerse, by the meanes of contrary winds, so that she could

could not lye her course,) consider vpon the Card or Plat how long the shippe hath made her way good, for so many points as the shippe hath sailed by: then (if by the Altitude of the Pole the shippe hath gone more then the dead reckening did shew you) repaire vnto the line of degrées, and set the one foote of the Compasse vpon the degree & place of the height of the Pole, and the other vpon the next East and West line: that done, beare it vnto the place you suppose the ship to bee in, & then bring forwards with the other Compasses, what point of the Compasse the ship hath sailed by, and at the meeting of the 2. paire of Compasses, make a note for the place that the shippe is in: from which place you may with your Compasses see, how the place assigned doth beare, and also how farre off you be from the same.

Furthermore (if you find by the height of the Pole, that you are not far short, as your reckening did shew vnto you) you must pull backe so much from the point that the shippe hath sailed by, as the height of the Pole doth shew vnto you by the order before rehearsed, &c,

To know how farre that the land is off from you by the sight of the land with your compasse, to doe it vpon the Land.

Furthermore (as I haue declared vnto you in the 14. Chapter going before) how to know how farre the land is off from you, (the distance betweene any two places being known) by setting the land with your compasse, euen so you may do the like by your card, as thus: setting the two places with your compasse, and knowing that the two places be so many leagues asunder, then shall you repaire to the Card, and according to the bearing of the two places by the points of the Compasse, you (being thwart of one of those two place's) shall apply it with your Compasses vnto your Scale: But for that in the Scale the leagues be so smal, you may assigne twenty leagues to be but one league, & open the Compasses vnto that proportion that the two places be asunder, and the one of them doe beare from the other: that done, open the Compasses againe from the Center of the compasse, vnto the place that you doe imagine to be the land, and then apply it vnto the trunke of measure, and you shall see how

many

many Leagues you be from the shore, and so forth. So that you may see that the Plat or Card is one of the necessariest things that is to be vsed in Nauigation. If you desire a full and perfecter vse of the Card, reade the booke called The Mariners Guide, wherein the vse of the Card is handled at large.

The 20. Chapter is of the Longitude and declination of 32. notable fixed starres, very necessary for Nauigation, with tables of their shining and at what point of your Compasse they doe both rise and set: and also tables for euery moneth of the yeere, declaring at what houre and minute they be South, running from the first day of the moneth to the fifteenth, and from the fifteenth to the last day, and will continue these 100. yeeres without much error.

If the Pole be raised more then 50. or 60. degrees, it is too high to be obserued by the crosse staffe.

AND furthermore, I doe thinke it conuenient for diuers considerations, to shew the longitude and declination of certaine of the most notablest fixed Stars that are neere vnto the Equinoctiall, to the number of 32. of them, which are very necessary for Nauigation in diuers respects, as thus: if you be vnto the North parts where the North Pole is raised more then 50. or 60. degrees, then the North starre is too high to be obserued or taken with the crosse staffe, (as I haue declared in the first Chapter) and it may chance so that in the day the Sunne is not to be seene at noone, and then these starres may serue your turne in the night.

These starres will serue beyond the Equinoctiall.

And furthermore they bee very good for them that haue occasion to trauaile beyond the Equinoctiall, where the North Pole is vnder the Horizon, in vsing their declination as they doe the Suns declination in all points, which doth appeare in the 7. 8. and 9. Chapters of this booke. And furthermore

thermore they be very necessary for sea-faring men to know the houres of the night, both by their being vpon the Meridian, and also by their rising and setting: you may know the true time of their rising and setting in euery Latitude by their declination from the Equinoctiall, whether they decline to the South parth, or North parts, as is declared by the declination of the Sunne in the 11. Chapter.

To know the rising and setting of the starres ill all places by the order of the xi. Chapter.

And furthermore, by any of the Starres you may try the variation of your compasse by night, &c. Now shall follow the Table of all these starres. The first row of this Table containeth the names of the starres. The second, the signes whereunto the Longitude of the starres is referred. The third, the degrées of the signes. The fourth, the minutes belonging thereunto. The fifth, the degrées of declination. The sixt, the odde minutes belonging thereunto. The seauenth sheweth towards what part they decline, by letters, of which N. signifieth Septentrionall, or North declination; S. signifieth Meridionall, or south declination: as in the Table doth appeare. The eight doth shew nothing but the bignesse of the starres. Now followeth the Table.

The order of the Table following.

A Table of the fixed Starres newly corrected by *T. Flood* according to their longitude, 1600.

The names of the starres.	Signes	Longi. deg. mi.	Declin. deg. mi	To what part the stars decl.	The mag or highnes of the starres
Whales backe	Aries	6. 25	12. 20	S declin.	3 mag:
Whales belly	Aries	16. 25	12. 22	S declin.	3 mag:
Rammes horne	Aries	28. 5	17. 17	N declin.	3 mag:
Rammes head	Taurus	2. 25	21. 33	N declin.	3 mag:
Bulles eye	Gemini	4. 5	15. 38	N declin.	1 mag:
Orions left foote	Gemini	10. 35	8. 43	S declin.	1 mag:
Orions left shoulder	Gemini	14. 45	5. 56	N declin.	1 mag:
Orions girdle the first	Gemini	18. 45	0. 38	S declin.	2 mag:
Orions right shoulder	Gemini	23. 25	6. 17	N declin.	1 mag:
Great Dogge	Cancer	9. 5	16. 12	S declin.	1 mag:
Lesser Dogge	Cancer	20. 35	6. 13	N declin.	1 mag:
Brightest in Hydra	Leo	21. 25	6. 53	S declin.	2 mag:
Lions necke	Leo	23. 35	21. 52	N declin.	2 mag:
Lions heart	Leo	23. 55	13. 55	N declin.	1 mag:
Lions backe	Virgo	5. 35	22. 43	N declin.	2 mag:
Lions taile	Virgo	16. 5	16. 50	N declin.	1 mag:
Rauens head	Libra	5. 45	20. 45	S declin.	3 mag:
Rauens wing	Libra	9. 25	15. 16	S declin.	3 mag:
Virgins spike	Libra	18. 5	9. 0	S declin.	1 mag:
Arcturus betwixt Bootes legges.	Libra	18. 25	21. 20	N declin.	1 mag:
South balance	Scorpi.	9. 25	14. 14	S declin.	2 mag:
North balance	Scorpi.	13. 35	7. 46	S declin.	2 mag:
Scorpions heart	Sagit.	4. 5	25. 25	S declin.	3 mag:
Hercules head	Sagit.	16. 15	14. 57	N declin.	3 mag:
Serpents head	Scorp.	10. 15	12. 57	N declin.	4 mag:
Eagle	Capri.	25. 15	7. 54	N declin.	2 mag:
Dolphins taile	Aquar.	9. 5	10. 0	N declin.	3 mag:
Goats taile	Aquar.	16. 45	17. 51	S declin.	3 mag:
Aquarius legge	Pisces	3. 5	18. 10	S declin.	3 mag:
Pegasus sholder	Pisces	18. 5	12. 58	N declin.	2 mag:
Pegasus legge	Pisces	23. 35	25. 58	N declin	2 mag:
Whales taile	Pisces	27. 5	20. 12	S declin.	3 mag:

The vse of this Table is this: when you haue taken the height of any of these starres vpon the Meridian, then looke what declination the starre hath from the Equinoctial, and whether it declineth toward that Pole, which is aboue the Horizon, or toward that Pole which is vnder the Horizon. If the starre declineth toward that Pole which is aboue the Horizon, subtract the declination from the meridian altitude thereof, the remainder giueth the height of the Equinoctiall. If the starre declineth toward that pole which is vnder the Horizon, adde the declination to the meridian altitude thereof, the totall summe giueth the height of the Equinoctiall, and then by the height of the Equinoctiall, the height of the Pole is knowne, as the seuenth Chapter doth declare.

How to vse the starres declination to knowe the height of the Pole.

And now I thinke it conuenient to make certain Tables, to shew vnto you at what houre & time any of these starres be vpon the Meridian, whereby they may the better know these starres, I will also shew vnto you how long any of these starres do shine or tarrie aboue the Horizon in the Latitude from the Equinoctiall of London, that is, at 51 or 52, degres. And also at what point of the compasse any of these starres do rise or set, which will serue this 100 yeeres, without much errour.

A Table to know the rising and setting of these Starres, by what point of the Compasse, and how many houres they be aboue our Horizon, the Pole being raised 51. or 52. degrees.

THE Whales back riseth East and by South, and vnto the Southwards: and shineth ten houres and better.

The Whales belly (in a maner) as the Whales back.

The Rammes horne riseth East Northeast. and setteth West Northwest: and shineth 15. houres 16. minutes.

The Rammes head riseth East Northeast, and setteth west Northwest: and shineth 16 houres 4 minutes

The Bulles eye riseth neere the East Northeast, and setteth neere ẏ west Northwest, & shineth 15. houres 2 minuts.

Orions left foote riseth neere the East and by South, and setteth neere the west and by South, and shineth 10. houres and 9. minutes.

Orions left shoulder riseth East & to ẏ Northwards, & setteth west & to the Northwards, & shineth 12 houres 45 min.

The first in Orions girdle doth rise a little to the Southwards of the East, and setteth a little to the Southwards of the west, and shineth 11. houres 46. minutes.

Orions right shoulder riseth East, and vnto the Northwards, and setteth west and vnto the Northwards, and shineth 13 houres 12 minutes.

The great Dog riseth East Southeast, and setteth west southwest, and shineth 9 houres.

The lesser Dog riseth East & vnto ẏ Northwards, & setteth west & vnto the Northwards, & shineth 13 houres 10. min.

The brightest in Hydra riseth East and vnto the Southward, and setteth west and vnto the Southwards, and shineth 11. houres and 7. minutes.

The Lions neck riseth East northeast, and to the Northwards, & setteth west northwest and to the Northwards, and shineth 16. houres 16 minutes.

The Lions hart riseth nere the East Northeast, & setteth neere the west northwest, and shineth 14 houres 50 minutes.

The Lions backe riseth nere the northeast, & by east, and setteth neere the Northwest and by west, and shineth 16. houres 26. minutes.

The Lions taile riseth nere the east northeast, and setteth neere the west northwest, and shineth 15 houres 12 minutes.

The Rauens head riseth neere the east southeast, & setteth nere the West Southwest, & shineth 8 houres 12 minutes.

The Rauens wing riseth ner the East southeast, & setteth nere the West southwest, & shineth 8 houres 50. minutes.

The Virgins spike riseth East & to the southwards, & setteth west & to the southward, & shineth 11 houres 4 minuts.

Arcturus

Arcturus betweene Bootes thies, riseth neare the Northeast and by east, and setteth neare the Northwest and by West, and shineth 16 houres 20 minutes.

The south Ballance riseth neere the east southeast, & setteth neere the west southwest: and shineth 9 houres 36 min.

The North Ballance riseth neere the east and by South, and setteth neere the west and by South, and shineth tenne houres 38 minutes.

The Scorpions heart riseth neere the Southeast and by east, and setteth neere the Southwest and by West, and shineth seuen houres and fiue minutes.

Hercules head riseth neere the East northeast, and setteth neere the west northwest, and shineth 14 houres 56 minutes.

The Serpents head riseth neere the east northeast, & sets neere the west northwest, & shineth 14 houres, 40 minutes.

The Eagle riseth neere the east and by north, and setteth neere the west and by north: and shineth 13 houres, 24 min.

The Dolphins taile riseth east and by north, and setteth west and by north, and shineth 15 houres, 57 minutes.

The Goates taile riseth neere the East southeast, and setteth west southwest, and shineth 9 houres, 20 minutes.

Aquarius leg riseth neere the East southeast, and setteth west Southwest, and shineth 8 houres, 54 minutes.

Pegasus shoulders riseth nære the East northeast, and setteth nære the West northwest, and shineth fourtæne houres thirty two minutes.

Pegasus legge riseth neere the northeast, and setteth nære the northwest, and shineth seuenteene houres, six minutes.

The Whales taile riseth East southeast, and setteth west southwest, and shineth seuen houres, forty eight minutes.

Furthermore, if you desire to know the time of any of these Starres being about the Horizon in all latitudes, then repaire to the 11. chapter, so you shall know it there by their Declination: euen by the same order that you know the Sunnes being aboue the Horizon, by the Sunnes declination.

The 11 Chap. will shew how long any of these starres will shine in all places.

A Table of the fixed Starres.

These Stars being south frō the first day of Ianuary vnto the 15.			Ianu. from the 15. to the last.			Febru frō the 1. to the 15.			Febru from the 15. to the last.		
Whales backe	5.20	E	1	4.20	DA	1	3.20	DA	2.20.	DA	
Whales belly	5.54	E	2	4.54	DA	2	3.54	DA	2.54	DA	
Rammes horne	6.28	E	3	5.28	E	3	4.28	DA	3.28	DA	
Rammes head	6.45	E	4	5.45	E	4	4.45	DA	3.45	DA	
Bulles eye	8.52	E	5	7.52	E	5	6.52	E	5.52	DA	
Orions left foote	9.23	E	6	8.23	E	6	7.23	E	6.23	E	
Orions left shoulder	9.28	E	7	8.28.	E	7	7.28	E	6.28	E	
First Orions girdle	9 50	E	8	8.50	E	8	7.50	E	6.50	E	
Orions righ: shoulder.	10.12.	E	9	9.12	E	9	8.12	E	7.12	E	
Great Dogge	11.4	E	10	10.4	E	1	9.4	E	8.4	E	
Lesser Dogge	12.0	E	11	11.0	E	10	10.0	E	9.0	E	
Brightest in hydr	12.4	E	12	11.4	E	11	10.4	E	9.4	E	
Lions necke	2.12	M	13	1.12	M	13	12.12	M	11.12	E	
Lions heart	2.13	M	14	1.13	M	14	12.13	M	11.13	E	
Lions backe	3.0	M	15	2.0	M	15	1.0	M	12.0	E	
Lions taile	3.42	M	16	2.42	M	16	1.42	M	1.42	M	
Rauens head	5.2	M	17	4.2	M	17	3.2	M	2.2	M	
Rauens wing	5.19	M	18	4.19	M	18	3.19	M	2.19	M	
Virgins spike	5.51	M	19	4.51	M	19	3.51.	M	2.51	M	
Twixt boots thighs	5.56	M	20	4.56	M	20	3.56	M	2.56	M	
South Balance	7.16	M	21	6.16	M	21	5.16	M	4.56	M	
North Balance	7.33	MD	22	6.33	M	22	5.53	M	4.33	M	
Scorpions heart	8.54	MD	23	7.54	MD	23	6.54	M	5.54	M	
Hercules head	9.14	MD	24	8.14	MD	24	7.14	MD	6.14	M	
Serpents head	9.41	MD	25	8.41	MD	25	7.41	MD	6.41	M	
The Eagle	12.19	DA	26	11.19	MD	26	10.19	MD	9.19	MD	
Dolphins taile	1.12	DA	27	12.12	DA	27	11.12	MD	10.12	MD	
Botes taile	1.48	DA	28	12.48	DA	28	11.48	MD	10.48	MD	
Water pourers leg	2.48	DA	29	1.48	DA	29	12.48	DA	11.48	MD	
Pegasus shoulder	3.47	DA	30	2.47	DA	30	1.47	DA	12.47	DA	
Pegasus legge	4.12	DA	31	3.12	DA	31	2.12	DA	1.12	DA	
Whales taile	4.24	DA	32	3.24	DA	32	2.24	DA	1.24	DA	

March from the first to the 15.			March from the 15. to the last.			April from the first to the 15.			April from the 15. to the last.			Maie from the first to the 15.		
1	1.20	DA	1	11.20	DA	1	11.20	MD	1	10.20	MD	1	9.20	MD
2	1.54	DA	2	12.54	DA	2	11.54	MD	2	10.54	MD	2	9.54	MD
3	2.28	DA	3	1.28	DA	3	12.28	DA	3	11.28	DA	3	10.28	MD
4	2.45	DA	42	1.45	DA	4	12.45	DA	4	11.45	DA	4	10.54	MD
5	4.52	DA	5	3.52	DA	5	2.52	DA	5	1.52	DA	5	12.52	DA
6	5.23	DA	6	4.23	DA	6	3.23	DA	6	2.23	DA	6	1.23	DA
7	5.28	DA	7	4.28	DA	7	3.21	DA	7	2.28	DA	7	1.28	DA
8	5.50	DA	8	4.50	DA	8	3.50	DA	8	2.50	DA	8	1.50	DA
9	6,12	E	9	5.12	DA	9	4.12	DA	9	3.12	DA	9	2.12	DA
10	7.4	E	10	6.4	DA	10	5.4	DA	10	4.4	DA	10	3.4	DA
11	8.0	E	11	7.0	E	11	6.0	DA	11	5.0	DA	11	4.0	DA
12	8.4	E	12	7.4	E	12	6.4	DA	12	5.4	DA	12	4.4	DA
13	10.12	E	13	9.12	E	13	8.12	E	13	7.12	DA	13	6.12	DA
14	10.13	E	14	9.13	E	14	8.13	E	14	7.13	DA	14	6.13	DA
15	11.0	E	15	10.0	E	15	9.0	E	15	8.0	E	15	7.0	DA
16	11.42	E	16	10.42	E	16	9.42	E	16	8.42	E	16	7.42	DA
17	1.2	M	17	12.2	M	17	11.2	E	17	10.2	E	17	9.2	E
18	1.19	M	18	12.19	M	18	11.19	E	18	10.19	E	18	9.19	E
19	1.51	M	19	12.51	M	19	11.51	E	19	10.51	E	19	9.51	E
20	1.56	M	20	12.56	M	20	11.56	E	20	10.56	E	20	9.56	E
21	3.16	M	21	2.16	M	21	1.16	M	21	12.16	M	21	11.16	E
22	3.33	M	22	2.23	M	22	1.33	M	22	12.33	M	22	11.33	E
23	4.54	M	23	3.54	M	23	2.54	M	23	1.54	M	23	12.54	M
24	5.14	M	24	4.14	M	24	3.14	M	24	2.14	M	24	1.14	M
25	5.41	M	25	4.41	M	25	3.41.	M	25	1.41	M	25	3.41	M
26	8.19	MD	26	7.19	MD	26	6.19	MD	26	5.19	MD	26	4.19	M
27	9.12	MD	27	8.12	MD	27	7.12	MD	27	6.12	MD	27	5.12	MD
28	9.48	MD	28	8.48	MD	28	7.48	MD	28	7.48	MD	28	5.48	MD
29	10.48	MD	29	9.48	MD	29	8.48	MD	29	7.48	MD	29	6.48	MD
30	11.47	MD	30	10.47	MD	30	9.47	MD	30	8.47	MD	30	7.47	MD
31	12.12	DA	31	11.22	MD	31	10.12	MD	31	9.12	MD	31	8.12	MD
32	12.24	DA	32	11.24	MD	32	10.24	MD	32	9.24	MD	32	8.24	MD

A Table of the fixed Starres.

	Maie from the 15. to the last.			Iune from the first to the 15.			Iune from the 15. to the last.			Iuly from the first to the 15.			Iuly from the 15. to the last.	
1	8.20	MD	1	7.20	MD	1	6.20	MD	1	5.20	MD	1	4.20	M
2	8.54	MD	2	7.54	MD	2	6.54	MD	2	5.54	MD	2	4 54	MD
3	9.28	MD	3	8 28	MD	3	7.28	MD	3	6.28	MD	3	5 28	MD
4	9.45	MD	4	8 45	MD	4	7.45	MD	4	6.45	MD	4	5 45	MD
5	11.52	MD	5	10.52	MD	5	9.52	MD	5	8.52	MD	5	7 52	MD
6	12.23	DA	6	11.23	MD	6	10.23	MD	6	9.23	MD	6	8.23	MD
7	12.28	DA	7	11.28	MD	7	10.28	MD	7	9.28	MD	7	8.28	MD
8	12.50	DA	8	11.50	MD	8	10.50	MD	8	9.50	MD	8	8.50	MD
9	1.12	DA	9	12.12	DA	9	11.12	MD	9	10 12	MD	9	9.12	MD
10	2.4	DA	10	1.4	DA	10	12.4	DA	10	11.4	MD	10	10 4	MD
11	3.0	DA	11	2.0	DA	11	1.0	DA	11	12.0		11	11 0	MD
12	3.4	DA	12	2.4	DA	12	1.4	DA	12	12.4	DA	12	11 4	MD
13	5.12	DA	13	4.12	DA	13	3.12	DA	13	2.12	DA	13	1.12	DA
14	5.13	DA	14	4.13	DA	14	3.13	DA	14	2.13	DA	14	1.13	DA
15	6.0	DA	15	5.0	DA	15	4.0	DA	15	3.0	DA	15	2 0	DA
16	6.42	DA	16	5.42	DA	16	4.42	DA	16	3.42	DA	16	2 42	DA
17	8.2	DA	17	7.2	DA	17	6.2	DA	17	5.2	DA	17	4 2	DA
18	8.19	DA	18	7.19	DD	18	6.19	DA	18	5.19	DA	18	4 19	DA
19	8.51	DA	19	7.51	DA	19	6.51	DA	19	5.51	DA	19	4 51	DA
20	8.56	DA	20	7.56	DA	20	6.56	DA	20	5.56	DA	20	4 56	DA
21	10.16	E	21	9.16	DA	21	8.16	DA	21	7 16	DA	21	6.16	DA
22	10.33	E	22	9.33	DA	22	8.33	DA	22	7.33	DA	22	6.33	DA
23	11.54	E	23	19.54	E	23	9.54	DA	23	8.54	DA	23	7 54	DA
24	12.14	M	24	11.14	E	24	10.14	E	24	9.14	DA	24	8 14	E
25	12.41	M	25	21.41	E	25	10.41	E	25	9 41	E	25	8 41	E
26	3.19	M	26	2.19	M	26	1.19	E	26	12 19	E	26	11 19	E
27	4.12	MD	27	3.12	M	27	2.12	M	27	1.12	M	27	12 12	M
28	4.48	MD	28	3.48	M	28	2.48	M	28	2.48	M	28	12.48	M
29	5.48	MD	29	4.48	MD	29	3.48	M	29	2.48	M	29	1.48	M
30	6.47	MD	30	5.41	MD	30	4.47	MD	30	3.47	M	30	2.47	M
31	7.12	MD	31	6.12	MD	31	5.12	MD	31	4 12	MD	31	3 12	M
32	7.24	MD	32	6.24	MD	32	5.24	MD	32	2.24	MD	32	3.24	M

Auguſt from the first to the 15.			Auguſt from the 15. to the laſt.			Septemb. from the first to the 15.			Septem. from the 15. to the laſt.			Octob. from the first to the laſt.	
1	3.20	M 1	2.20	M 1		1.20	M 1		12.20	M 1		11.20	E
2	3.54	M 2	2.54	M 2		1.54	M 2		12.54	M 2		11.54	E
3	4.28	M 3	3.28	M 3		2.28	M 3		1.28	M 3		12.28	M
4	3.45	MD 4	3.45	M 4		2.45	M 4		1.45	M 4		12.45	M
5	6.52	MD 5	5.52	MD 5		4.52	M 5		3.52	M 5		2.52	M
6	7.23	MD 6	6.23	MD 6		5.23	M 6		4.23	M 6		3.23	M
7	7.28	MD 7	6.28	MD 7		5.21	M 7		4.28	M 7		3.28	M
8	7.50	MD 8	6.50	MD 8		5.50	MD 8		4.50	M 8		3.50	M
9	8.12	MD 9	7.12	MD 9		6.12	MD 9		5.12	M 9		4.12	M
10	9.4	MD 10	8.4	MD 10		7.4	MD 10		6.4	MD 10		5.4	M
11	10.0	MD 11	8.0	MD 11		8.0	MD 11		7.0	MD 11		6.0	M
12	10.4	MD 12	9.4	MD 12		8.4	MD 12		7.4	MD 12		6.4	M
13	12.12	DA 13	11.12	MD 13		10.12	MD 13		9.12	MD 13		8.12	MD
14	12.13	DA 14	11.13	MD 14		10.13	MD 14		9.13	MD 14		8.13	MD
15	1.0	DA 15	12.0	15		11.0	MD 15		10.0	MD 15		9.0	MD
16	1.42	DA 16	12.42	DA 16		11.42	MD 16		10.42	MD 16		9.42	MD
17	2.3	DA 17	2.2	DA 17		1.2	DA 17		12.2	DA 17		11.2	MD
18	3.19	DA 18	2.19	DA 18		1.19	DA 18		12.19	DA 18		11.19	MD
19	3.51	DA 19	2.51	DA 19		1.51	DA 19		12.51	DA 19		11.51	MD
20	3.56	DA 20	2.56	DA 20		1.56	DA 20		12.56	DA 20		11.56	MD
21	5.16	DA 21	4.16	DA 21		3.16	DA 21		2.16	DA 21		1.16	DA
22	5.33	DA 22	4.33	DA 22		3.33	DA 22		2.33	DA 22		1.33	DA
23	6.54	DA 23	5.54	DA 23		4.54	DA 23		3.54	DA 23		2.54	DA
24	7.14	DA 24	6.14	DA 24		5.14	DA 24		4.14	DA 24		3.14	DA
25	7.41	DA 25	6.41	DA 25		5.41	DA 25		4.41	DA 25		3.41	DA
26	12.19	E 26	9.19	E 26		8.19	E 26		7.19	E 26		6.19	E
27	11.12	E 27	10.12	E 27		9.12	E 27		8.12	E 27		7.12	E
28	11.48	E 28	10.48	E 28		9.48	E 28		8.48	E 28		7.48	E
29	10.48	M 29	11.48	E 29		10.48	E 29		9.48	E 29		8.48	E
30	1.47	M 30	12.47	E 30		11.47	M 30		10.47	E 30		9.47	E
31	2.12	M 31	1.12	M 31		12.12	M 31		11.12	E 31		10.12	E
32	2.24	M 32	1.24	M 32		12.24	M 32		11.24	E 32		10.24	I

A Table of the fixed Starres.

Octo. from the 15. to the last.		Nouem. fro the first to the 15.		Nouem. from the 15. to the last.		Decemb. from the first to the 15.		Decem from the 15. to the last	
1	10.20. E	1	9.20 E	1	8.20 E	1	7.20 E	1	6.20 E
2	14 54 E	2	9.54 E	2	8.54 E	2	7.54 E	2	6.53 E
3	11.28 E	3	10.28 E	3	9.28 E	3	8.28 E	3	7.28 E
4	11.45 E	4	10.45 E	4	9.45 E	4	8.45 E	4	7.45 E
5	1 52 M	5	12.52 M	5	11.52 E	5	10.52 E	5	9.52 E
6	2.23 M	6	1.23 M	6	12.23 M	6	11.23 E	6	10.23 E
7	2.28 M	7	1.28 M	7	12.28 M	7	11.28. E	7	10.28 E
8	2.50 M	8	1.50 M	8	12.50 M	8	11.50 E	8	10.50 E
9	3.12 M	9	2.12 M	9	1.12 M	9	12.12 M	9	11.12 E
10	4.4 M	10	3.4 M	10	2.4 M	10	1.4 M	10	12.4 M
11	5.0 M	11	4.0 M	11	3.0 M	11	2.0. M	11	1.0 M
12	5.4 M	12	4.4 M	12	3.4 M	12	2.4 M	12	1.4 M
13	7.12 MD	13	6.12 M	13	5.12 M	13	4.12 M	13	2.12 M
14	7.13 MD	14	6.13 M	14	5.13 M	14	4.13 M	14	2.13 M
15	8.0 MD	15	7.0 M	15	6.0 M	15	4.0 M	15	4.0 M
16	8.42 MD	16	7.42 MD	16	6.42 M	16	5.42 M	16	4.42 M
17	10.2 MD	17	9.3 MD	17	8.2 MD	17	7.2. M	17	6.2 M
18	10.19 MD	18	9.19 MD	18	8.19 MD	18	7.19 M	18	6.19 M
19	10. 51 MD	19	9.51 MD	19	8.51 MD	19	7.51 MD	19	6.51 M
20	10.56 MD	20	9.56 MD	20	8.56 MD	20	7.56 MD	20	6.56 M
21	12.16 DA	21	11.16 MD	21	10.16 MD	21	9.16 MD	21	8.16 MD
22	12.33 DA	22	11.33 MD	22	10.33 MD	22	9.33 MD	22	8.33 MD
23	1.54 DA	23	12.54 DA	23	11.54 MD	23	10.54 MD	23	9.54 MD
24	2.14 DA	24	1.14 DA	24	12.14 DA	24	11.14 MD	24	10.14 MD
25	2.41 DA	25	1.41 DA	25	12.41 DA	25	11.41 MD	25	10.41 MD
26	5.19 DA	26	4.19 DA	26	3.19 DA	26	2.19 DA	26	1.19 DA
27	6.12 E	27	5.12 E	27	4.12 E	27	3.12 DA	27	2.12 DA
28	6,48 E	28	5.48 E	28	4.48 E	28	3.48 DA	28	2.48 DA
29	7.48 E	29	6.48 E	29	5.48 E	29	4.48 E	29	3.48 DA
30	8.47 E	30	7.47 E	30	6.47 E	30	5.47 E	30	4.47 E
31	9.12 E	31	8.12 E	31	7.12 E	31	6.12 E	31	5.12 E
32	9.24 E	32	8.24 E	32	7.24 E	32	6.24 E	32	5.24. E

Now

NOW this Table serueth for euery moneth in the yeare (being exactly calculated) the time of their being south, or touching your Meridian (or as some terme it) Noonestead; serving very well the Sea-men to take the height of them with their instruments vpon the Sea, referring it vnto the Table of Declination that goeth before: the first is the houres, the second minutes, the third be the letters that shew you whether they be south by day or by night, in the euening or morning, in the forenoone or afternoone: of which the letter E doth signifie Euening, the letter M signifieth Morning, the letters DM signifieth day in the morning, and the letters DA signifieth day in the afternoone (as I said before) the very houre and minute of their being South. Now you see that I haue put to their being South in the day, as well as in the night, to the intent to know the houre of the night as well by their setting, as also by your Compasse, which I shewed you in the first chapter or rule, namely, to bring your 32 points, into 24 houres: and in like manner, in the fourth chapter by shining of the Moone to diuide the shining into equall parts; then those parts being equally diuided with the houre and minutes, the time of their shining before their being South, sheweth the iust rising of the stars, and the other time of their shining after their being South sheweth their setting (as I haue declared in the rule of the shining of the Moone.) Now (seeing the Table runneth from the first day of euery moneth to the fifteenth: from the fifteenth to the last day,) if you will know the exact time betweene the first day or the fifteenth day, and betwixt the fifteenth day and the last, do this; take how many daies of the moneth is past, either from the first day or 15 day, and pull so many times foure minutes from that number as there are dayes past, either from the first or fifteenth day, the remainder will shew you the true time of their being South. That knowne, you shall doe (as is aforesaid) for their rising and setting.

The signification of the letters in the Table.

The

The Regiment for the Sea.

The 21. Chapter sheweth you the making of a generall instrument, to know the houre of the day by, throughout all the world.

NOw for the making of your Instruments for the Sea, with their vses, you shall repaire to the booke of Nauigation made by Martin Curtise a Spaniard, imprinted by master Iugge, late Printer to the Queenes maiesty: else I should haue shewed you the making of diuers instruments, as also the making of the Equinoctiall Diall with his vse, which is very profitable to know the houre of the day by, in all latitudes through the whole world, for your Compasse is not to know the houre of the day by the sunne, neither in the morning nor euening, neither can you know when the Moone is East or West, she hauing North declination, as being in the signe of Taurus, Gemini, Cancer, or Leo, becaus your Compasse standeth flat as doth your Horizon. Wherefore it is very good for sea-men to vse the equinoctial Dialls, for that it sheweth them the true houre of the day in all latitudes, and also the Moone doth giue a true shadow in that Diall in all Latitudes, for I doe know that Sea-men are very many times deceiued, where it doth flow an East and West Moone, or any point betweene the Southeast and Northeast. Because in setting the Moone with their Compasse (being in the North signes,) she seemeth to be East by the Compasse, when she is neere the East Southeast in her course: and in like manner when the Moone seemeth west by the Compasse, she shall be a little more than west South-west in her course: which is a very perilous matter to them that should put into a tide, harborow, or hauen, where he knoweth there is water enough for him, if he doe come at a full sea, and then by the error of the Moons shadow vpon the Compasse he is deceiued: and when he findeth the error, he thinketh that the cause thereof commeth by the occasion of some storme of wind that is like to follow, imputing it thereto, that the tide doth not keepe his course, whereas the very cause

The Sunne and Moone doe giue a full shadow by the compasse.

The Equinoctiall diall giueth a true shadow all the world ouer.

A perillous matter.

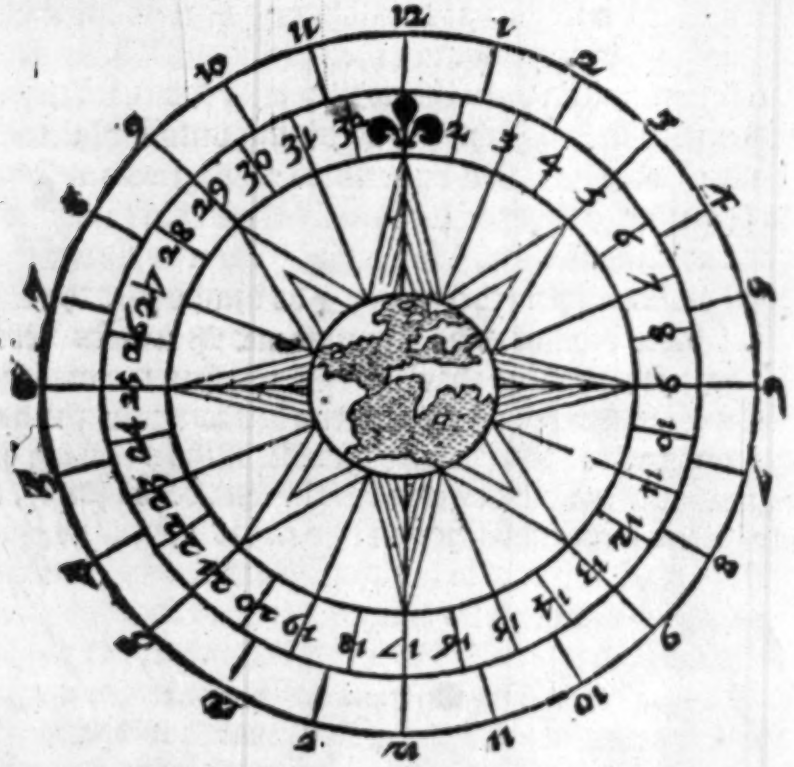
cause groweth by no other meanes then by receiuing a false shadow by the Horizontal cõpasse: which falleth out, especially if the Moone be neare her greatest declination, vnto the North parts, that is in the signe of Gemini and Cancer. And also the effect is most perceiued if the dragons head bee in the beginning of the signe of Aries: for then if the Moone bee in the beginning of Cancer, she shall haue 5. degrees more in declination from the equinoctiall then the sun shall haue at his greatest declination vnto the north parts. So that reseruing the Moones paralar, (which is according vnto the latitude of any place) the Moone shal be declined 28. degrees and a halfe vnto the north part of the Equinoctiall: so that for auoiding of these inconueniences, I would wish them to vse the Equinoctiall dials. And furthermore, I do thinke that the Equinoctiall dials bee not vsed amongst our Mariners here in England, for that the charges is so much in the making of them, & yet it serueth no other turne but to know the houre of the day, and to shew the true shadow of the Moone. I haue not knowne them vsed by any English master or Pilot, but onely by one man, which person had not it for the proper vse therof, but rather had it to say, that he had such an instrumẽt as no English man had the like, and to brag that he had such an instrumẽt, that he could do great feats therwith in going of long voyages, &c. I would haue no man offended with me. I know the nature & qualitie of some that take charge, they will haue instruments and other things thereunto appertaining, and yet they themselues do not know the vse of them, yet they will seeme to be cunning, and that they need no instructions of any man, for that they know all things, and yet in respect know nothing. (But notwithstanding) I would wish them that be seafaring men, to vse themselues to the Equinoctial dials, for that they do serue two notable turnes, as wel at home in these our chãnels, as also in long voyages: they make them with a very easie charge: for whereas in the Art of Nauigation it is shewed how to make them in brasse, they make them with wood in this manner, take a peece of bords

The Moone may decline 28. degrees and a halfe from the Equinoctiall.

Of men that will haue instruments and know not the vse of them.

An easie way to make an Equinoctiall diall with little charge.

boords end of fiue inches broad more or lesse at your discretion, and halfe an inch in thickneſſe, then hauing cut it round and plained it ſmooth, you may either graue in it the 32. points of the Compaſſe, or elſe paint them vpon it, with ſome colors, with the 24. houres, vpon both the ſides as this figure ſheweth.

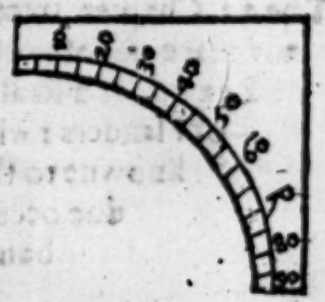


That done, take a wyer of iuſt the Diameter of the Inſtrument, then put it through the middle or Center of the Inſtrument, then make it faſt, that the one end be halfe way through on the one ſide, and the other halfe on the other ſide: this done, make a frame with three peeces of boords end, to hang the Diall or inſtrument vpon, with one pin on the Eaſt point, and another on the weſt point: then take another peece of boords end being ſquare, and with a paire of Compaſſes ſtrike a quarter of a circle, of iuſt the bigneſſe of the quarter of the Diall, and cut all that away, and then the reſt

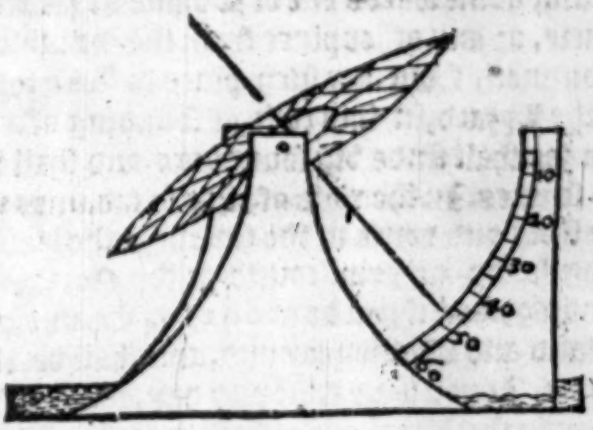
of

of the square that is left (at the edge of the quarter of the circle) diuide into 90. equall parts, marking it thus, 10. 20. 30. 40. 50. 60. 70. 80. 90.

As in this forme: last of all let this be placed in the middle of the frame, so that 93 may stand right vnder the very middle of the Diall, and there made fast, in such forme, that the very end of the wyer when the Diall is put vp and downe may touch the hollow part that you see cut away, which is called the Directer, and so it is finished, and will stand altogether in this forme.



The Equinoctiall line.



The vse of this Diall is most necessary in a Shippe, for that you haue occasions to transport your selues into all the climates. And to know the true houre of the day, doe this: Set this Diall by your Compasse, (the directer vnto the Southwards) and then (you knowing how high the Pole is aboue the Horizon) set the end of the wyer right against that degree, in the directer, and the other end of the wier wil point iust vnto the Pole, then loke what shadow ẏ wier doth giue

by

by the Sunne, that is the true houre of the day. In like manner you may know the true houre of the night by the Moones shadow, and also the Moone will giue a true shadow of her place, &c.

The 22. Chapter treateth of the soundings, comming from any place out of the Occident Sea, to seeke Vshant or the Lyzard, and so all alongst till yau come to the coast of Flanders: with other necessary matters to be knowne to them that be Channellers that doe occupie or deale among sands, bankes, or such other like.

BEcause it is necessarie to be had in memorie, for that it is a dangerous place to hit or fall with, to enter into the sleeue comming homewards out of Spaine or Portugall, or from Barbarie, or any other place from the Southwards, a Ship that commeth from any such place to seeke the Isle of Vshant, or the Lyzard, in this rote of sounding of a 100. or ninetie fadames shall finde big soundings, and shall be neere about to the seames. In the rote of eightie fadames you shal finde cockle shels and dents in the tallow of the lead: and in this sounding holde on your course to the North, till you change sounding, then if you be at 60 or 64 fadame, you shall finde small sand and Mathey ground, and shall bee neere the coast of Vshant. If you haue time and day, goe seeke it in the Northeast, & you shall be about 10 leagues frō ỹ Isle. If you come making your course about Base freed, you shall finde course sand, red & browne, & you shal haue sounding at 40 fadame: if you be towarde the banke of Silley, you shall haue soundings, at 86. or 90. fadame, and you shall finde in the tallow stonie ground, and shall bee well shot towards the banke of Silley. When you be at eightie fadame, you shall find small black sand, and shall bee well towards the Lizard. When you be at sirtie or 64. fadame, you shall finde white sand and white soft worms, and shallbe very nigh to the Lizard. Betweene the Cape of Cornewall and Vshant amid the

The Sounding neere vnto Vshant and the Lizard.

the Channell you shall finde 17. fadame and neere enough. Betweene Dodmon and the Fo2ne, in the channel you shal haue 40. o2 50. fadame. If you be thwart of Plimmouth o2 the Start, you shall find streamy ground & dents in the tallow and soundings 41. o2 42. fadams. At the comming from Po2tland you shall haue 35. fadams, and smal shingles. And when you be nigh to Po2tland 30. fadams, and stones like beanes, and this sounding will last till Saint Aldam, and in the said sounding you shall finde white stones like b2oken Aules, and other that be bigger, and then you shal be thwart of Saint Aldam o2 of the Ile of Wight.

Two o2 th2ee leagues from the Ile of Wight, you shall find 25. fadame, with dents and clefts in the tallow like smal th2eads, two o2 th2ee leagues from the Casks, you shall finde 40. fadame, and bigge stones ragged and blacke. Betweene the Ile of Wight and the Yag, the dæpest is but 35 o2 40. fadame. Betwæne the Ile of Wight and Lantargate, the dæpest is but 25. o2 30. fadame. Betwæne Beachy and the Ile of Wight a league from the land, you shall find 38. fadame, and Poppel as bigge as Beanes. Betwæn Fairely and the water of Dunme in the dæpest, but 25. fadame. Betweene Folstone and Bolaene, is a banke that is called Rippe rappe, and lieth in the midway betwæn Picardie and England, and hard a bo2d by it, is 26. o2 27. fadam. In the straight of Calyce is 30. fadame, in the Rode of Calyce is 16. fadame. And alongst the coast of Flanders is but 23. fadam, the deepest. Thus much haue I said fo2 ỳ entrãce of the Sleeue, to come to the Riuer of Thames, and in the entrance in the midway betweene Ushant and Lizard, the Pole Artick is eleuated 50. degrees and a halfe, and the Equinoctiall is lifted aboue the Ho2izon 39. degrees and a halfe. And furthermo2e, fo2 them that are Channellers and occupiers amongst sands and bankes, & such other like, they must haue conuocation of these things following. As this: first if you know how the Channell doth lie right betweene any two sands: you must view the land to take some marks

The sounding in the Channel.

The height of the Pole at the entrance of the Sleeue.

Necessary things to be noted for them that are Channellers & dealers amongst sands.

of it, to be a leading marke. And that you shall do thus: loke some thing that standeth farre into the land, that you may know it well, being right open with the Channell of the sands, then take another marke nere vnto the waters side, and the one to be right against the other, when that you bee in the middle of the Channell: And then you knowing these two markes well, they will be leading marks vnto you for euer to keepe that Channell.

And then furthermore, if it doth so happen that the Channell doth turne to keepe another course, or else (some other danger lying in that way) you must haue a thwart mark, to know both when that you are cleere of any danger, and also when that you are open of another Channell, and that you shal do as before is declared, to take some marke within the land, & also another neere vnto the sea, water, or riuers side to be your thwart marke when you bring them both toge-
ther. And this is most specially to be noted: that these
be very yare, and good when the one is far distant
other: and those marks very slow, and asketh some
in sayling to open and shut them which are nere
vpon the land. And furthermore, for them that are
lers or occupiers amongst sands, for that the weath
alwaies cleere, when they haue occasion to passe t
such places, it is good for them to sound the Channels p
fectly, and to know by the depth, what side of the Channell they are vpon, and also how farre they are shut into that Channell. And also in like manner to know by the sounding of any of the sides of the Channell, whether they be neere any of the sands or dangers, or any breach off: for that some sands or dangers there be, hauing faire or good soundings or shaldings, that they may borrow off and on their pleasure. There be againe some sands or dangers, that there is no borrowing or sounding of them, and those be neall or deepe hard vnto the sands or dangers: for that the water is deepe hard vnto the sand: and these are very dangerous sands for any Ship to come neere, for that they shall haue

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the water very deepe, and by and by be aground. Yet furthermore, it is very good for them that be Channellers and occupiers amongst sands, to know which way the tide doth set at euery time of the tide: for that many times it happeneth so, that when the sands be vnder the water, the tide doth set crosse the Channell, which is a dangerous matter if it be not very well considered by the Master or Pilot, &c.

The twenty three Chapter is as touching the variation of the Compasse, called the Northeasting and the Northwesting of the Compasse: and how to giue a guesse to know the Longitude.



So touching the variation of the compasse, called the Northeasting, or Northwesting, it is supposed that ỹ compasse doth vary by proportion, in the sayling to the Eastwards or westwards: if it varieth by proportion, that the north point is varied one point from the North, at 22. degrees and a halfe, and so vntill the North point doth stand Northeast or Northwest: and that is, when you are 90. degrees from the Meridian that ỹ compasse was made at, to the Eastwards or Westwards. Some also are of another opinion, that the compasse doth vary by no proportion, but doth vary according vnto the nature of some kinde of Minerals that is in some country or some kinde of Ilands that draw the compasse by the mines of the Loadestone or Magnes stone, that they touch their compasse with when they make them. And furthermore, the booke of Martin Curtise, called the Art of Nauigation, saith, that the Compasse doth vary by proportion in this manner: which is by the proportion of a Circle, for that the North point doth alwaies point vnto a place in the heauens that is vnmoueable,

Of the Compasse to vary to euen proportiõ.

Of the Compasse to vary by no proportion.

Of the Compasse to vary according vnto the proportion of a circle that is swiftly, and slowly.

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Of the Compasse to vary by no proportion.

Of the Compasse to vary according vnto the proportion of a circle that is swiftly, and slowly.

and therfore as you do transport your selfe to the Eastward or Westward, ỳ Northpoint doth stil point vnto that place in the heauen: wherefore (as he saith) when you be 90. degrees in Longitude from the place that the Compasse doth stand due South and North, that is, when you be one quarter of the circumference of the earth, in that Parallel the Compasse will be varied foure points from the North: and as you do trãsport your self further, then the North point of the compasse wil come nerer & nerer into the north: and whẽ you are iust half the circumference of the earth, that then the North point will stand due North vpon the Pole again, for that you are come to the same Meridian again vpon the opposite part of the earth (as it doth appeare in the third part, and fifth Chapter of the said booke of Martin Curtise:) but if that be true, then the compasse doth vary swiftly at the first, and slowly afterwards, in order like vnto the Sunnes declination: by which they may very well know by what order the Compasse doth vary, and so by the variatiõ you may giue a nere estimation of the Longitude, and know in how many degrees the Compasse is varied one point, two points, three points, or four points, which is the greatest variation. Now to know the proportion, doe this: First make a circle with a payre of compasses, and strike a line by the Center to the circumference, which shall be your Meridian line, then strike another line by the Center acrosse, that you may diuide the circle into foure equall parts, and then because 45. degrees is the greatest variation, set 45 vnto the East part and West part, diuiding euery one of the quarters of the circle into 45 equall parts, according to ỳ greatest variation: then make another circle of ỳ Diameter, that the circumference touch that Center of the circle, and diuide it as you diuided the compasse, after the rate of 32. points, although you need not to diuide but that side to the Northwards, and then the Northeast & Northwest point will fall vpon 45. degrees: that done, draw lines according to the points of the compasse vnto the Eastwards or Westwards, and lok how they

To know in how many degrees going vnto the Eastward or Westward, that the compasse doth vary one point, two points, or three points. &c.

they fall vpon the line that commeth from the Center of the other circle: of which euery quarter is diuided into 45. equal parts, and then (at the very place that the line doth touch) draw Parallel lines in ẏ circle by proportion at euery place to the Eastwards or Westwards, that the line of the compasse falleth vpon: and that will shew you iustly how many degrees you shall transport your self vnto the Eastwards or Westwards for the varying of the first point, second point, and third point: and in like manner the greatest variation which is the fourth point. So that (according to that order) it will fall out in this manner, that the compasse will be varied one point at neere eleuen and ½. It will be varied two points neere about 24. degrees and a halfe.

To know how many degrees is in the varying of one point.

It will be varied three points at 42. degrees and about a halfe. But it will not be varied the fourth point vntil you be 90. degrees frō the Meridian that the compas was made at: which is a very slow varying being 47 degrees, & ½ before the compasse doth vary one point, & betweēn the third point & the second point, being 18. degrees for the varying of that point, and then from the second point vnto the first point is 13. degrees and better, and last of al from the varying of one point to the Meridian it is eleauen degrees & ½ part, euery degree being according to that parallel you are in, which doth alter according vnto your Latitude from the Equinoctiall, for vnder the Equinoctiall it is 60. English miles, or 20. English leagues vnto one degree. In the Latitude of 60. degrees from ẏ Equinoctiall, there in that parallel it is but 30. miles or 10. English leagues vnto one degree, &c. As it is plainely shewed in the 16. chapter of this book, wherein is an instrument shewing you how many miles of Longitude will answere vnto a degree in euery seuerall Latitude by the applying of a thread at your discretion: So that I conclude, if the compasse doth vary by that order of proportion that Martin Curtile doth attribute vnto it, you may giue a neere guesse to finde the Longitude by the varying of the compasse, being neere vnto the Meridian in which the compasse doth stand

If you will know how many leagues a degree is, repaire to the 16. Chapter.

due South and North: but if you be very far from the Meridian that the compasse was made for, then the variation is so slow, that you can haue no iudgement at all (by the variation of the compasse) to find any Longitude.

There may grow some error in the proportion of the varying of the Compasse.

And furthermore, if the compasse doth vary by that proportion that Martin Curtise doth affirme, I am of this opinion, that there may grow some error in proportion in those compasses that are made for any Meridian: for those compasses that are made heere with vs in England, whereof the needle doth stand foure or fiue degrees vnto the Eastwards of the North, (as doth appeare by all the needles made for Dials, & also of the compasses) if they would haue the North point to stand due North, then the end of the wyres vnder the Card of the compasse should stand foure or fiue degrees vnto the Eastwards of the Flouredeluce: wherefore it may bee doubted, that the compasse may vary more the one way then it will the other way, by that proportion that the end of the wyer doth stand from the North point. For (if in the greatest variation) the ende of the wyer (vnder the Card of the Compasse) doth stand Northwest, the Flouredeluce of the Compasse should stand neer halfe a point to the Westward of the Northwest.

And in like manner at the greatest variation, if the end of the wyer doth stand Northeast, then the Flourdeluce should stand neer halfe a point vnto the Northwards of the Northeast, &c. Wherefore the Compasses that were deuised by Norman, are very good to reforme those causes. But this cause is very speciall, to giue a neer guesse of the Longitude, that is to say, the compasse will varie more quickly (according to the order before written) by which you see they may transport themselues further into the Eastwards or Westwards, before that the Compasse doth vary one point, then it doth for the other three points, so that they are not able to giue any estimation at all, by the varying of the compasse to know any Longitude: for that they may trauaile more then the quarter of the circumference of the earth, before the com-

Of slow varying of the Compasse.

passe

passe will be varied one point backwards and forwards.

And furthermore, it is very good for them that are Masters or Pilots of Ships to note, when they do fall with any land where the compasse is varied, to make a remembrance in a booke, how many points and degrees the Compasse is varied in euery place where they came vnto, which wil be a great helpe for them to finde that place againe. And to finde the variation, it is declared in the first Chapter. Of making notes of the variation,

An Hydrographicall discourse to shew the passage vnto Cattay fiue manner of waies, two of them known, and the other three supposed; wherin you shall know the distance of Cattay, and also by what points or winds of the compass that you shall saile for the attaining thither, and also the rest of the East Indies.

WHereas it hath beene oftentimes in question of late yeeres now in this our age, for the discouery for to finde out a way for to come vnto Cattay, Chinai, and the Ilands of Molvccas; with other places in the East Indies: I haue thought it good to write this Hydrographicall discourse, to goe to Cattay 5. manner of waies, for that there are some people that are doubtfull whether that there be any such place, other some are doubtfull that there is no passage thither.

So some holding one opinion, and some another, I haue taken vpon me for to shew vnto them the passage to goe vnto Cattay fiue manner of waies, whereof two of them are knowen, and the other three supposed.

Wherein I haue set downe particularly the courses, that is to say, by what point of the Compasse that you must saile, and all the distance what number of leagues that it is from place to place, hauing perused the best Cosmographers, and for that wee haue no Charts, Plats Hydrographicall,

that doth shew the true courses & distance, it is possible that is not exactly true, but only to glance somewhat neere the matter: Therefore you must not looke to haue it so certaine that there is no error in it, neither am I assured that it is not altogether vntrue, either in the distance or courses, but that you haue some aid by this, &c.

To goe vnto Cattay that way that the Portugals doe goe vnto Calicut and the Ilands of Moluccas, which is about by Cape bone Sperance, after that thou art departed from the Lizard or Cape of Cornewall, being the Westerne part of England, you must make your direction from thence vnto ỹ Canary Ilands, hauing Latitude twenty eight and a halfe, the course is neer the South Southwest about 500 leagues.

And on the starreboord side is the West Ocean sea, and on the Larboord side, first the coast of Fraunce, then the coast of Spayne and Portugall, and then the coast of Barbary in Africa, &c.

From the Canary Ilands you must set your course vnto Cape de verde in Ginney, the Latitude thereof is neere 15. degrees, and the course is South about 270. leagues, and on the starboord side is the West Ocean Sea, and on the Larboord side the coast of Barbary and Ginney. From Cape de verde, you must goe vnto Cape Palmas, the Latitude is neere foure degrees, and the course is South and by East, about 130. leagues, on the Starboord side is an Ocean sea, and the Larboord side, the coast Ginney. And from thence make your direction to Cape bone Sperance being the Southermost part of all Aethiopia, forsaking the coast, & making your course through the sea, the course is neere the South-east & by South; 1660. leagues, and the Altitude of the Antarctick pole, is about 35. degrees aboue the Horizon, and on the Starboord side is Brasile in America, and the great River of Platte, and on the Larboord side is the coast of Castill de Mine, in Ginney and Binney, and the coast of Aethiopia, &c. But if that you will keepe the coast of Ginney, then being departed from Cape Palmas, goe vnto the Iland of

Saint

Saint Thomas, your course is East and by South, neer fiue hundred fifty leagues, and the Iland of S. Thomas hath no Latitude, for that it is directly vnder the Equinoctiall, and on the starbord side is the Ocean Sea, and on the Larbord side is the coast of Castel de Mine, and the coast of Binney &c.

And from the Iland of Saint Thomas, vnto Cape bone Sperance, the course is South and by East, about seuen hundred fifty leagues, and on the starbord side is the Ocean sea, and on the larboord side the coast of AEthiopia: from Cape bone Sperance, you must set sayle vnto the great Iland of S. Laurence, namely to the Westermost part of the Iland, and that hath latitude toward the Antarcticke Pole, aboue 28. degrees, and the course is from Cape Bone Sperance, Northeast and by East, about 550. leagues, on the starbord side, is the vnknown land that lieth towards the Antarctick pole, and on the larbord side the Coast of Ethiopia, and the length of the Iland is about 360. or 400. leagues, and the longest way of the Iland doth lye East Northeast, & West Southwest, and is from the maine land of AEthiopia about eighty or 100 leagues, &c. Furthermore by the way, I doe thinke it good for to shew the course and distance vnto the red sea, and also the course and distance vnto Calicut. To set out your course from the Easternmost end of the great Iland of S. Laurence, which hath the Antarcticke Pole raised 13. degrees, towards the straights of the red sea, the course is North and by East about 470. leagues, and the latitude of the straights, is about 10 degrees, towards the North pole. and this straight is greatly occupied, for that all the spices that serueth the Turkes dominions, and also some parts of Christendome, is brought from the Iland of Moluccas and other parts of the East Indies, as Calicut, and such like places, and so by shipping transported into the red sea, & so put on land in Egypt and carried ouer a little part of the land, and then they are newly embarked, and brought downe to the great Riuer Nilus, and put aland at Alexandria in Egypt,

Egypt, that is a Port, in the midland sea, and from thence they are transported by shipping vnto a number of places both in the Turkes dominions, & other places Christned, &c.

From the straights vnto the hither end of the red Sea in Egypt, the course is for the most part Northwest and North Northwest, about neere 500. leagues. And going into the red sea, the starboord side is the coast of Arabia, and the Larboord side is first the coast of Aethiopia, and then the coast of Egypt, &c.

And also if that you will goe from the East end of the great Iland of Saint Laurence, vnto the famous merchant towne called Calicut in Indie, then your course is Northeast and to the Eastwards about 860. leagues, and the Latitude is fiue degrees to the North parts, and on the starboord side is the Ocean sea, and the Larboord side is the coast of Ethiopia, and the straights of the red sea, and the coast of Arabia, and the straights of the Persian sea, and the Iland of Ormes, &c. But if that you will hold on your course to goe vnto Cattay, then from the East end of the great Iland of Saint Laurence, to the great Iland called Traprobane, your course is East Northeast, or East & by North aboot 1100. leagues: but it is possible, that in these courses, you may meete with a number of Ilands, for that all this East Ocean sea is very full of great and small Ilands, and the middle of this great Iland lyeth direatly vnder the Equinoctiall, and the length of this Iland is neer 300. leagues, and on the starboord side is the vnknowen lands, towards the Antarcticke Pole, and on the Larboord side the straights of the redde Sea, Arabia, the Iland of Ormes, the Persian sea, Calicut, and the great riuer of Ganges. And now for to depart from the great Iland of Traprobrane, to goe vnto the great Iland of Gilolo, being the greatest Iland amongst all the Moluccas, the course is East about one thousand leagues, but there lyeth a number of Ilands in the way, and on the starboord side is the Iland of Iaua and Borneo, and on the Larboord side, the greatest heape of the Moluccas Ilands. The Iland of Gilolo

hath

hath no Latitude, for that it lieth directly vnder the Equinoctiall; from the Iland of Gilolo vnto the Coast of China, the course is North and by West, about 500. leagues.

The Latitude of China is about 25. degrees, and on the starboord side is the south sea, and America, and the larboord side is the Ilands of Moluccas: but for to goe from the great Iland of Iaprobane, the next way to China, the course is Northeast and by East 1000. leagues, and then on the starboord side, you shall haue al the Moluccas Ilands, and on the Larboord side the main land of Asia or East India: and then from the Coast of China, vnto the great Bay of Quinsay in Cattay, the course is North and by East about 100. leagues, and the entrance of the Bay of Quinsay, the Latitude is 35. degrees, and on the starboord side is the firm land of America, and the great Iland of Iupan, and the Larboord side the coast of China and Cattay, &c.

Now thus much haue I said as touching the way to come out of England to goe vnto Cattay and East India, hoping that the reasonable Reader will not enuy me, for this vsing my discourse, neither you must not looke so exquisitely vnto it, for that it cannot be the exact truth: for as I doe suppose that no English man hath seen any true Chart or Plat of all the East India, wherefore I doe suppose that you will beare with this my discourse, &c.

And now furthermore as touching this discourse for to come out of England to goe vnto Cattay, the second way, and that is known that the Sea will let them haue passage, that is to say, through the straights of Magellane, and so into the South sea, as thus, first to make their direction from the West part of England vnto the straights of Magellane: although that indeed there can bee no longer passage by Sea, but that the ships are to seeke some places for to water at, and other easements, yet notwithstanding I do meane to make but one direction for course from England vnto the straights of Magellane, for that the Master or ỳ Pilots may seeke their watring places most best for their purposes, &c.

From

From the Lizard vnto the straights of Magellane, the course is for the most part South southwest and to the westwards, about 2400 leagues, and the Latitude of the straights is 52. degrees and a halfe towards the Antarcticke Pole, and on the starboord side is the firme land of America, and the Larboord side Europe and Africa, &c.

And through the straights, the course may be West or West Southwest 100. or 140 leagues before that they be clearely in the South sea; and now being into that sea, they may goe either into Cattay or the Moluccas, or the Port of Pannama, that is the place where the King of Spaine hath all the treasure that commeth from Peru. And from thence it is carried vp a certaine riuer, and transported ouer the necke of a land, and then imbarked and brought downe another Riuer, and so landed at Nombre di dios, and from thence transported by ships into Spaine, &c.

Being through the straights of Magellane, if that you will goe into the Port of Pannama, then your course is for to goe North northwest, or northwest, and by North, or North and by West, as the land will giue them passage, for that there hath not bin made any true Plats for that coast in that sea, and doth containe in leagues frō the straights vnto the port of Pannama, 1100. or 1200. leagues. But if that you will go from the straights vnto Cattay, as it is a sea that is not vnto the South parts neere the straights well knewen, so there may ly many Ilands in that Sea that you may meete with, and also there may be rocks and dangers there in like manner that are not knowne, but the generall course is Northwest vnto Cattay or China, about 2800. leagues, hauing on the starboord side the maine land of America, and on the Larboord side the vnknowne land that lieth towards the Antarcticke Pole, and also the Ilands of Moluccas and Calicut, and thus much haue I said as touching the passage vnto Cattay, by these two wayes that are knowne. But heere is one thing to bee noted, for (as it hath been reported) the Portugalls Carickes going vnto Calicut, when

that

that they be at Cape bone Sperance, then they do not directly set their course the next way, but stand South ouer towards the land that lieth to the Antarctick Polewards, and the cause thereof is the great Current, that is at Cape bone Sperance, continually running from the East into the West, and when that they haue gone a hundred or a hundred and fifty leagues vnto the southwards of the Cape, then they set their course for to go with Calicut, so that outwards they do not come neere the great Iland of Saint Laurence, but goe a great deale to the southward of it, for that they will not be let by the great currant: But when they doe come homewards, then they doe come hard by the Ile of S. Laurence, and so directly with Cape bone Sperance, for that they will haue all the help that they may with the Current, then they goe West Northwest into the sea with the maine land of America, till that they be halfe that sea ouer, and then they do set their course to goe homewards, as it is not vnknowne, that when the Spanish Fleete doth goe outwards to the West Indies, they do go to the Canaries, and so west into the sea, and so hold in by the south land of the Bay of Mexico, for that they haue some help by the Current: but when that they do come home, then they do come by the northland of the Bay of Mexico, betweene the Iland of Cuba and Terra Florida, for that they will haue the Current homewards to help them. Also it is reported that in the straights of Magellane that the Current runneth continually from the East into the West. Now thus much haue I said, as touching the two wayes vnto Catay, for that it is knowne that there is passage by Sea, if that it were attempted, although the passage is very long, &c.

The third way, that is not knowne, but supposed that it may be passageable, is by the Northwest, the which of late Captaine Frobisher hath begun to enter into, and hath discouered it as far as a place now called Meta Incognita, which he himself did call Frobishers Straights, but yet notwithstanding it is doubtfull, whether that be a straight to giue passage

sage to come into the East Ocean sea, or South sea, for any thing that is knowen yet, it may be as well a Bay as otherwise, but notwithstanding whether that be a straight or not, it is possible that there may be a passage thereabout, between the Norther part of America, as betweene Labradore and Gronland, and such lands as lye toward the North Pole.

Wherefore now for to depart from England to goe vnto Cattay by the Northwest, first in making your direction from the west part of England, vnto the place called Meta Incognita, the course is West Northwest about 650. leagues, and the Latitude thereof 603. degrees, and on the Starbord is first Ireland and Iseland, and Freeseland, and on the Larbord side, is the Ocean sea. Being at Meta Incognita, you must discouer thereabouts, where that you may find sea for to giue you passage, and yet if you do find sea, you must hold on your course West vntill that you haue passed one thousand, or one thousand one hundred leagues. For if that you should hold on any Southerly course, you should imbay your selfe in the maine land of America, for the extension of the backe side, or Northside of America, is not much lesse then 1000. leagues, before that you shall open the way into the East Ocean sea; and in this West course on the starbord-side is the North Pole, and such lands as lye that way, if there be any, on the Larbord side, is the main of America, &c. And after that you haue sailed West 1000. leagues on the North part of America, you may then direct a more southerly course, because then you may be open of the East Ocean sea, for the most part of the best Cosmographers lay the opening of that sea opposite vnto vs in our Meridian, and then holding on a southerly course, you may hale vnto the great Bay of Quinsay about 400. or 500. leagues. And the Latitude of the North part of the Bay of Quinsay in Cattay is about forty fiue degrees, and on the starbord side is the coast of Asia, as Mangie and Cattay, and on the Larbord side America. And thus much haue I said as touching the third way to goe to Cattay, &c.

The

The fourth way to goe vnto Cattay, not knowen but supposed, is by the Northeast part, or North part of Ruſſey, about by that way that M. Burrowes began the diſcouery, about by a land that is called Noua Zembla, which is a countrie or point of a land that extendeth to the Northwards, it is not knowen how farre, and yet it may be poſſible that it is nauigable that waies if it were attempted.

I will a little vſe my diſcourſe concerning the paſſage that way vnto Cattay. The way and diſtance vnto the North Cape in Norway is not vnknowne vnto a number of Seamen, the Latitude thereof is 71. degrees, twentie minutes, therefore I doe thinke it beſt to begin the direction and ſetting out of the courſe Eaſt, vntill that they doe come to the land of Noua Zembla, and then falling with that place they are to make their diſcouery as the land wil giue them leaue, and ſo in this direction it may be poſſible that they may find a Sea to giue them paſſage. It may bee alſo that when they may meete with land, they ſhall be conſtrained to goe Northeaſt, or North Northeaſt, vntill that the North Pole be raiſed eighty or eighty fiue Degrees; yet they may hold on their courſe, vntill ſuch time as they ſhall be incombred with Ice, for it may be ſo, that in Latitude of eighty degrees, there ſhall be no Ice, although that on the Coaſt of Baccalaos, you may haue Ice, in the latitude of fifty degrees, for no man can tell vntill ſuch time as he hath made experience: and now in this paſſage vnto the Eaſtwards from the North Cape vntill that they ſhall haue the Sea open to come into the Southwards in the Sea of Cattay, it may be about one thouſand, or 1200. Leagues, and then in this paſſage on the Starreboord ſide is firſt Norway and Lapia, and the Bay of Saint Nicolas, and the great riuer of Ob & Noua Zembla, and the Eaſt part of Aſia, and on the Larboord ſide the North Pole, and thoſe lands that lye that waies if there bee any: and now in the following of the Coaſt of the land which may bee Southeaſt, or South Southeaſt or ſouth, it may be fiue hundred or 600. leagues

vnto

vnto the Bay of Quinſay in Cattay, and on the Starboord ſide is Aſia and the coaſt of Mangie and Cattay, and on the Larboord ſide the maine land of America, &c.

And furthermore it may be poſſible for to find paſſage for to goe to Cattay, betweene Noua Zembla, and the country of Samwetes, through the ſea of Vagates; and this paſſage may be ſomewhat ſhorter, then for to goe vnto the northwards of Noua Zembla: and then you ſhall haue in this paſſage, vpon the ſtarboord ſide, firſt the country of Samwetes, as Pichora, and the riuer of Ob & Tartaria, &c. And on the Larboord ſide, Noua Zembla, &c.

And this I doe ende as touching the Northeaſt paſſage to goe to attaine vnto Cattay the fourth way, &c.

As touching the fifth way to goe vnto Cattay, it may bee that in my diſcourſe it may ſeeme a meere fooliſhneſſe and a thing vnpoſſible for it to be done, & yet notwithſtanding no man can tell, before that it is put in experience, and yet it is the neareſt way if that it be nauigable, and my meaning is this, for to go directly vnto the Pole, if ſo be that there be no land to let the paſſage. Now it is poſſible that ſome will ſay that it is the frozen Zone, but notwithſtanding if that there be not land that way, then it is not frozen, for the great ſalt ſea neuer freezeth; & whereas you doe ſee the great quantity of yce on the coaſt of Labradore and Bacalayas, it is a token that thereabouts is much land towards the North Polewards, and ſo is frozen in ſounds & riuers, and in the breaking vp of the yeere, it doth come driuing out to ſea: for in reſpect they do ſeldome ſee any yce at the north cape, nor 100. leagues north off from thence, it is a great token that there is no land towards the Polewards, and before that it hath beene put in proofe it cannot be knowen.

But all the doubts for going vnto the Polewards, are for feare of too much cold, and yet notwithſtanding it may be reaſonable warme right vnder the Pole, for any thing that is knowen vnto the contrary, by the long continuance of the Sunne in Summer, for that in the time of nine weekes, the

Sunne

Sunne is neuer lesse than 20. degrées aboue the Horizon going round about them, so that the continuance of the Sunne must enforce the ayre to be reasonable warme, especially if that there be no Ice driuing in the Sea, for it is not so cold at Mare Incognita, if that they be not amongst the Ice, for if that they bee at Sea and not amongst Ice, then it is very warme, and also if that they be ashore, then it is warme in like manner, so that the cold is caused by no other means, than by the cold breach or ayre that commeth from the Ice. And now to proceede: to goe vnto Cattay, you must goe directly North, till that you bee right vnder the Pole, and then goe South to the opposite part beyond the Pole, which may be done if that you be not let by any land that lieth in the way. The whole distance in this course from the riuer of Thames vnto the Bay of Quinlay, is but 1680. leagues, which is a very short way in respect of the other. But now it is possible that some will make argument and say, that it is not possible for any man to make any direction, or set any course being directly vnder the Pole, for that it is not known which way that the Compasse will stand, and also in like maner being vnder the Pole, al places is South which way soeuer you goe, and also the Sunne is equally one height, so that you can make no prose which way is forwards, and which way is backwards: therefore it is to be supposed, that some wil say, that it is not possible to make any instruments to assigne any course to any place appointed: for truth it is that being vnder the Pole, any place assigned is south from vs, what quarter of the world soeuer wee are in, and if that the Sea will giue vs passage, our course is south to goe vnto it, &c. Yet notwithstanding, I will shew vnto you what you shall do to make a perfect direction vnto any place appointed being right vnder the Pole, so that you shall know whether you do go backwards, or forwards, or any other way that you shal appoint, so that you may see the sun; & that must be done thus. First prepare a perfect good clocke

that goeth with a spring, the which clocke must be made in that order, that the directer or pointer may goe round in 24. houres, and it must so be marked that it may end 24. houres at noone, and then to begin one. This clocke or Diall being well made, and keeping the time truly, when that you doe approach neer to the Pole within one hundred leagues, that is the Latitude of 85. degrees, (for so far the Compasse may serue, and also you may correct the Compasse well enough, for that the Sunne is ten degrees higher on the South part, then it is on the North part) and now being within fiue degrees of the Pole, set your clocke to worke, and let the 24. houre be noone, and then when that you are directly vnder the Pole, looke if that the pointer doth stand vpon the 24. houre, then that part or quarter that the Sun is in, is right backe againe, and if that it point 12. houres, then towards the Sun-wards is right forwards, and if that it point fiue houres, then the part of the world towards the Sun is due West from you, and is one quarter of the earth, that direction will set you right vpon it, and if 18. houres, then towards the Sun doth appoint you that place that is East one quarter of the earth, &c.

And now for to set any course to stirre the shippe vpon to any place appointed, note this for an ensample, I would go directly homewards, and then I will set the Flie of a Compasse before him that shall stirre: and for so much as I come out North, and I must goe home South, I lay the Card or Flie steady before mee, and the South point right with the Ships head or stemme, and so I do set the Clocke by it, now if that the Clock doth point twenty foure houres, for that afore was by noone, then I doe stirre the Shippe right vpon the Sunne, and if the clock doth appoint three houres, then hee that doth stirre must keepe the Sunne vpon the Southwest, and so shall the ship goe that South that shee came from, and if that the clocke doth point fiue houres, then hee that doth stirre must keepe the Sunne vpon the West

point,

point, and if the clocke shew 9. then keepe the Sunne vpon the Northwest. If the Clock doth shew 12. then the Sunne must be on the North point, that is right with the stearne of the ship. And if the clocke doth shew 15. houres, then he that stirreth must keepe the Sunne vpon the Northeast point, if 18. then must he keepe the Sunne on the East point, and if 21. houres, then on the Southeast point, &c. But now if that you would goe directly forwards, then lay the North point right with the shippes head, and when the clocke doth point 12. then stirre right vpon the Sunne, and so in like manner must you stirre by the Sun as I haue afore shewed you by ensample, so that you may see by this Clocke or Diall, how you may assigne your selfe to keepe any course into any place in the whole world, you being vnder the pole, and then when that you are departed from the Pole 100. leagues, that is, 5. degrees, then you may vse your Compasse, and correct it by the Sun at your pleasure. And thus much I haue said as touching the passages to goe vnto Cattay, wherefore gentle Reader beare with my rudenes, for that I am so bold to vse my discourse vpon the passage vnto Cattay. And furthermore, some men haue been of that opinion, that when that they are in the East Ocean Sea, that they shall meet with no shipping, as about Cattay and China, &c. But notwithstanding it is a sea wherein there is a huge number of Shippes both great and small, for whereas there is such great trade of Merchandize, & also such a number of Ilands both great & small, and also such a number of commodities in those Ilands, as any man may iudge that it is likely that there is great store of ships, and also Ordonance in their shipping, &c. And it is not vnknowen but that the great Cane of Cattay, is a Prince of great power as well by Sea as by land; then iudge you whether that such a Prince of such a force and wealth will not prouide for all things meete for warres. Therefore as soone as they come into those Coasts, they must orderly vse the trade of Merchandize, and not

vse force, &c. Moreouer vpon a time I being with Master Dee at his house at Murclacke, and falling in talke about the discouery to Cattay and the shipping there abouts: thereupon hee opened a booke and shewed me a note what number of shippes the great Cane had ready at one time to goe vnto sea about his affaires, you would think it vncredible, for the number was 15000. which is an huge armie by Sea: I replied againe that it might bee that they were but small things, and yet they might call them ships: and then he turned vnto another place, where the great Cane did send one of his Daughters by Sea, and did appoint 14. of his ships, and the least of the 14 shippes had 250 Mariners, besides al the rest of his Daughters traine, and such Nobles as did accompany her, which could be no small number. Therefore it is most manifest that the Cane is a great Prince of power as well by Sea as by Land.

FINIS.

A Table of the declination of the seuerall degrees of each signe calculated by T. Hood, according to the greatest declination of the Sunne which is now 23. degrees 28. minutes.

The degrees of the signes	Aries. Libra.		Taurus Scorpio		Gemini. Sagittarius		The degrees of the signes
	D.	M.	D.	M.	D.	M.	
0	0	0	11	29	20	10	30
1	0	24	11	50	20	23	29
2	0	47	12	11	20	35	28
3	1	11	12	32	20	47	27
4	1	35	12	52	20	58	26
5	1	59	13	12	21	9	25
6	2	23	13	32	21	20	24
7	2	47	13	52	21	30	23
8	3	10	14	12	21	40	22
9	3	34	14	31	21	49	21
10	3	58	14	50	21	58	20
11	4	21	15	9	22	7	19
12	4	45	15	27	22	15	18
13	5	8	15	45	22	23	17
14	5	32	16	3	22	30	16
15	5	55	16	21	22	37	15
16	6	18	16	39	22	44	14
17	6	41	16	56	22	50	13
18	7	4	17	13	22	56	12
19	7	27	17	29	23	1	11
20	7	50	17	46	23	5	10
21	8	12	18	2	23	10	9
22	8	35	18	17	23	13	8
23	8	57	18	33	23	17	7
24	9	19	18	47	23	20	6
25	9	41	19	2	23	22	5
26	10	3	19	17	23	24	4
27	10	25	19	31	23	26	3
28	10	46	19	44	23	27	2
29	11	8	19	57	23	28	1
30	11	29	20	10	23	28	0
	Virgo. Pisces.		Leo. Aquarius.		Cancer. Capric.		

FOR somuch as it is meete and conuenient for a Sea-faring man to be able to find out the declination of the Sunne continually, not onely by the helpe of the Table before set downe according to the day of the moneth, but also according to each seuerall degree of the signe which the Sunne possesseth, therefore I haue heere adioyned a Table of declination Calculated according to the Sunnes greatest declination, which is now esteemed to bee twentie three degrees, twentie eight minutes. The vse of the which Table is as followeth.

First you must search out by the Ephemerides (for that is best to be followed by the common sort) the place of the Sunne, that is to say, what signe, degree and minute the Sunne possesseth. Secondlie you are to consider whether the name of the signe which the Sunne possesseth be set at the toppe, or at the bottome of the Table. If it stand at the toppe, you must seeke the degree of the sayd signe on the left hand of the Table descending downeward. But if the name on the signe bee at the bottome of the Table, you must seeke the degree on the right

hand ascending vpward. Then going on directly from the degree forward either towards the right hand or towards the left as occasion requireth, vntill you come right against the name of the signe which the Sun possesseth, you shal find the declination. As for example: suppose the place of the Sunne were the 24. degree of Aries. The name of the signe standeth at the toppe of the Table, therefore I seeke out the 24. degree on the left hand, and going on from thence towards the right hand vntill I come right against Aries, I finde the declination to bee nine degrees, 19 minuts.

Againe, suppose the place of the Sunne to be the 14. of Cancer: I see the name of that signe to stand at the bottome of the Table, therefore I seeke out the 14. degree on the right hand, and going on from thence toward the left hand, vntill I come right against Cancer, I finde the declination to bee 21. degrees 20. minutes.

Thirdly, in the vse of this Table you are to note whether there be any minutes Adherent, and adioyned to the degrees of the signe, which the Sunne possesseth yea or no, as whether the Sunne possesseth precisely the 24. degree of Aries or the 24. degree and the 27. 40. or 50. minute, &c. If there be no minutes ouer and aboue the degrees, then the foresaid Table in such manner as I spake of before, affoordeth declination.

But if there be minutes adioyned to the degrees, then by proportion (otherwise called the rule of three) you must seeke out what declination may belong vnto the said minutes in this manner.

The first number in the proportion must alwayes be 60. minutes (because we argue from a degree, which is 60. minutes to the parts of a degree, which are the odde minutes Adherent to the whole degrees.) The third number must alwayes be the odde minutes adioyning to the degree of the signe which the signe possesseth: for the question is mooued concerning them. The middlemost or second number in the

proportion

proportion must be the difference of declination betweén the declination of the degree which the Sun possesseth, and the next degrée immediately following according to the natural succession of the numbers. The which difference may easily be found by the subducting of the declination of one degree out of another. The second number being found, and all of them being orderly set downe as the rule of three requireth, multiply the third by the second, and diuide the product by the fourth, the quotient affordeth the proportionall part answerable to the minutes propounded.

This proportional part must be added to the declination of the degrée assigned, if the name of the signe stand at ỳ top of the Table; but if the name of the signe stand at the bottom of the Table it must be subducted, so shall you find the declination of the degrees and minutes. As for example, suppose the Sunne possesse 22. degrees, 22. minutes of Aquarius, what shall his declination be? The first number in the rule of proportion must be 60. minutes, the third must be 22. (for they are the odde minutes adioyned to the degrees) and the second number I finde thus. The Sunne possessing the 22. degree of Aquarius declineth 14. degrees 12. minutes, and possessing the 23. of Aquarius hee declineth 13. degrees 52. minutes; the one of these subducted from the other, I find the difference of declination to be 20. minutes, this is the second number in the proportion; whereupon I say, if 60. giue 20. what shall 22. minutes giue? The quotient according to the rule, is seuen (the fraction being neglected as the custome is in these matters, because the common sort careth not for the seconds, &c.) And because the name of the supposed signe which the Sunne possesseth, standeth in the bottome of the Table, therefore I subduct the said seuen minutes out of the declination belonging to the 22. degree, and finde the declination of the 22. degree 12. minutes of Aquarius to be 14. degrees fiue minutes.

Againe, suppose that the Sun possesseth the 16. degrée 25 minute of Taurus, what shall his declination be? The dif-

ference of declination betweene the 16. and the 17. degree of Taurus is 17. minutes; whereupon I ſay: If the Sunne in going one whole degree, (that is, 60. minutes) doe decline 17. minutes, what ſhall his declination be in going 25. minutes? The quotient according to the rule is ſeuen minutes. And becauſe the name of the ſigne which the Sunne is ſuppoſed to poſſeſſe ſtandeth in the top of the Table, therefore I adde ſeuen minutes to the 16. degree, 39. minutes, which is the declination of the 16. degree of Taurus, and thereupon inferreth the declination of the 16. degree 25. minutes to be 16. degrees 46. minutes. Thus much briefely concerning the finding out of the declination of any degree which the Sunne poſſeſſeth.

FINIS.

The

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A Table of the declination of the ſeueral degrees of each ſigne calculated by T. Hood, according to the greateſt declination of the Sunne which is now 25. degrees, 28. min. 75.

FINIS.

The Mariners guide.

SET FORTH IN FORME OF A DIA-logue, wherein the vse of the plaine *Sea Card is briefely and plainely deliuered*, for the commodity of all such as haue *delight in Nauigation.*

Written by THOMAS HOOD,
Doctor in Physicke.

The Contents of the booke are set forth in the page following.

Ignoti nulla cupido.

Imprinted at London by *William Iones*, for *Edmund Weauer*.
1620.

The Contents of this Booke.

1 WHat things are ſpecially to be noted in the Sea-Card.
2 Two places being aſſigned, to finde how they beare one from another diuers wayes.
3 From a point giuen in the Card to draw a line Parallel to any point of the compaſſe.
4 To find the Latitude of any place aſſigned in the Card.
5 To find how many minutes are contained in any part of a degree of Latitude deſcribed in the Card.
6 To find the diſtance of any 2. places aſſigned in the Card.
7 The comparing of the Engliſh & Spaniſh leagues together, and the manner how to make the ſcale of leagues.
8 The Rhomb being giuen, and the Latitude to find how farre you be gone.
9 The way which the ſhip hath gone being giuen, and the Rhombe to finde the Latitude.
10 The way of the ſhip being giuen, and the Latitude to find the Rhombe.
11 To find the diſtance from the ſhoare.
12 To find how you haue raiſed or let fall the Pole.
13 In raiſing or letting the Pole to fall a degree to find how many leagues we haue runne.
14 To find the diſtance from the Meridian in rayſing or letting the Pole fall a degree.
15 How to keepe your trauerſe vpon the Card.
16 How to keepe your trauerſe vpon the Card of a ſmall pricke as well, as if it were of a great pricke.
17 How to keepe your trauerſe vpon the Card though the land lye very nigh the edge thereof.

To the Industrious Saylers
health and prosperity.



Entlemen Saylers, and whatsoeuer else you are that trauaile by Sea, for your sake I haue vndertaken this paines. I haue had to doe a long time with diuers of your profession, both for the making of Sea-Cards, and also for instructing them in Mathematicall matters belonging to Nauigation. Amongst whom I haue found many willing to learn, and by that meanes had an insight into their wants. I found certaine defects in pricking & vsing of the Card, and therefore I haue written this little Dialogue concerning the vse of the same, which if you please to peruse at your leisure, I hope you shall finde that therein, which shall be profitable to the ignorant, and not vnpleasant to the skilfull; howsoeuer it shall be eyther pleasant, or profitable, if you vouchsafe to take it in good part, it will be a meanes to moue me to a farther labour for your commodity.

Yours, Thomas Hood.

The vse of the common sea Card,

written in forme of a Dialogue.

M. NOW in good sooth Philomathes welcome. You are the last man whom I thought of, and I wished for, to the intent that I might haue a word or two with you, concerning the commodity which your Mathematicall studies haue afforded you, in matters of Nauigation.

P. Sir I thanke you must hartily for your good remembrance, and I must needs confesse, that there was no man with whom I more desired to speake then with you, partly that I might thankefully acknowledge the profit reaped by your instruction; and partly that I might request of you a farther matter, which being obtained, I shall thinke it no small increase of that heap of benefits, which many times I haue receiued at your hands.

M. Speake on Philomathes, what may it be which you desire, you may command me in any reasonable request.

P. Being at sea we were driuen to and fro, as wind and weather serued vs, hauing sometimes the light of the Sun, sometimes of the starrs, & sometimes being depriued of them both for a long season: yet notwithstanding the master of our ship and his mate, with diuers other of the company, had certaine plats, as they termed them (such as you commonly make, though I neuer greatly had regard to their vse) wherein they could keepe a reckoning of the way, which they had made, and set down a pricke representing the place wherein they were, and perform many other pretty conclusions. Me thought it was most pleasant to see them doe it, though I were much greeued with mine own ignorance in that matter: yet hauing an hope by your meanes to attaine to the knowledge thereof, I made such haste after mine arriual, as my businesse would afford to come vnto you, that I might be instructed in the vse of the aforesaid Card.

M. Oh

M. Oh Philomathes, that were a dangerous matter for me to vndertake, partly because herein I might seem to do, as Phormio the Philosopher did, who though hee had neuer seene any campe, dared notwithstanding to discourse of warlike affaires before Annibal, and partly because I should seeme to iustifie this kinde of projection of the plaine Card, which I cannot safely defend, because it is erroneous.

P. What, is it faulty? I pray you by what reason doe you proue your saying? they haue been vsed, and are yet retained by most excellent Nauigators of our time.

The plaine Card is erroneous.

M. I know it well Philomathes, that they are retained by many excellent men, but yet with this daily wish, that the same might be amended, and that there might a better projection be made: but heereby you may perceiue the error of these plats, in that the Meridians being parallel, the degrees of Longitude & Latitude which are in them haue not in any respect that Symmetrie and proportion one to another, which the Globe requireth: for in this plaine description of the Card, the degrees of Longitude, and Latitude in each seuerall parallel are of one quantity, & the Meridians meeting with the parallels, make perfect squares, which is contrary to the nature of the Globe, wherein the Meridians tending to one Pole, eyther North, or Southward, the degrees of Longitude in each parallel between the equator and the pole, ware shorter and shorter, according as the parallels come neerer and neerer to the pole, and the Meridians meeting with the parallels, make vnperfect squares, which the Geometricians call Trapezia.

P. Indeed I remember that the Saylors many times haue acknowledged some such kinde of fault, and by supposition imagining that two ships comming from the equator, and being two hundred leagues asunder, should bend their course Northward, vnder the Meridian, vntill they came to the 60. parallel, by the plaine Card they cannot be found to be lesse then 200. leagues distant one from another, which is vnpossible, considering that the 60. parallel, is but halfe the

content

content of the equator, and therefore those two ships should be but halfe that distance one from another, which they were distant vnder the equator, namely, 100. leagues. Moreouer I haue heard them acknowledge this, that there are three things which they can very hardly bring together vpon their Plat, without committing an error in the one of them, that is to say, the point of the compasse, vpon which they saile, the distance, and the Latitude: besides, the land is greatly distorted from his naturall forme, so that it is nothing like vnto that which we see described vpon the Globe: but notwithstanding all these things alleadged either by you or mee, let my request preuaile, which is, that you will vouchsafe to teach me how to vse the plaine Card.

M. If you will needs haue mee fulfill your desire Philomathes, I will doe what I can to satisfie you, crauing notwithstanding, that this my deed be not preiudicial to any other mans, whose experience in Hydrographicall matters is more then mine: when his discourse commeth forth, let it be accepted as it shall deserue, in the mean season, let this serue the turne.

P. Goe to then, first let vs consider what things are described in the Card, secondly what vse they haue.

M. The things described in the Card, and especially to be noted are these. First the Hydrographicall description of the Sea coast. Secondly the lines drawen ouer the face of the whole card, & concurring one with another iointly together in sundry places of the Card in one point, which I term the center of the Fly, for instruction sake, following the common phrase of speech. These lines are commonly called the points of the Compasse, but in teaching because I would gladly auoid the tediousnesse of that name, therefore hereafter I will cal them Rhombes, following the Spanish appellation, who hath so intituled, them in that (vpon the plaine Card especially) they represent after a sort the Geometricall figure, which is called a Rhombe. The names of these Rhombes are particularlie expressed by certaine letters, both in the

What things are especially to be regarded in the sea card.

top, and the bottome of the Card, the which letters haue this signification.

N.	Signifieth	North.
N.B.E.		North and by East.
N.N.E.		North north East.
N.E.B.N.		North East and by north.
N.E.		North East.
N.E.B.E.		North east and by east.
E.N.E.		East north east.
E.B.N.		East and by north.
E.		East.
E.B.S.		East and by south.
E.S.E.		East south east.
S.E.B.S.		South east and by eas
S.E.		South east.
S.E.B.S.		South east and by so
S.S.E.		South southeast.
S.B.E.		South and by east.
S.		South.
S.B.W.		South and by west.
S.S.W.		South south west,
S.W.B.S.		South west and by south.
S.W.		South west.
S.W.B.W.		South west and by west.
W.S.W.		West south west.
W.B.S.		West and by south.
W.		West.
W.B.N.		West and by north.
W.N.W.		West north west.
N.W B.W.		Northwest and and by west.
N.W.		Northwest.
N.W.B.N.		North west and by north.
N.W.N.		North north west.
N.B.W.		North and by west.

And heere I must tell you this Philomathes, that for so much

much as the maine vse of the Card dependeth vpon these lines, therefore you must endeuour your selfe toth and naile, to bee readie not onlie in the names, that you may say your compasse both forward and backeward, but also to the lines, that seeing of any line you may be readie to name it, and the line being named, you must be readie presently to find it vpon the Card.

The third thing to be noted, are the degrees of Latitude: contained betweene two small lines of the left hand of the Card, and hauing their numbers adioyning vnto them seuerally. The fourth and last thing is the scale of leagues both English and Spanish, set on the right hand of the Card, These are the cheefest things to bee obserued: as for the Cyphers set at the vpper, and nether end of the Card round about the Flies, they shall bee expressed heereafter in their places, because they are not essentiall matters touching the substance of the Card, but voluntarily set downe for remembrance sake.

P. Well then I pray you let me vnderstand the vse of the forenamed things.

M. The end of the Hydrographicall description of the coast is to lay forth vnto vs, not only the Baies, Capes, Angles, Ilands, mountaines, Ports, Points, and Riuers, but also the daungers of the Sea, so farre forth as they may conueniently be deliuered to the eie: in the which you are to note, that b. signifieth a Bay, c. a cape: a an angle, i an Iland: as Ilands: in a mountaine, po. a port: pa. a point, r. a riuer, t. a rocke, and a rocke, with other great daunger, if it haue prickes, the sands are expressed by small prickes.

P. There is no difficultie in vnderstanding of this, what say you of the lines which you call the *Rhombes*?

M. They haue this vse to direct or set our course from place to place, so that vpon them dependeth the answere vnto this proportion: Two places being assigned to find out the *Rhombe*, that is to say, the point of the compasse vpon which they lye, and how we are to direct our course from the one 1 Propo.

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N.B.E.		North and by East.
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E.		Eas
E.B.S.		Ea
E.S.E.		Ea
S.E.B.S.		So
S.E.		So
S.E.B.S.		So
S.S.E.		So
S.B.E.		So
S.		So
S.B.W.		So
S.S.W.		So
S.W.B.S.		So
S.W.		So
S.W.B.W.		So
W.S.W.		W
W.B.S.		W
W.		W
W.B.N.		West and by north.
W.N.W.		West north west.
N.W B.W.		Northwest and and by west.
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M. They haue this vse to direct or set our course from place to place, so that vpon them dependeth the answere vnto this proportion: Two places being assigned to find out the *Rhombe*, that is to say, the point of the compasse vpon which they lye, and how we are to direct our course from the one 1 Propo.

vnto the other. The which proposition is to be performed 2. seuerall waies, generally or particularly. The generall way is that, which teacheth vs to finde out ỳ Rombe howsoeuer the places bear one from another, whether they lie iust vpon a Rhombe as precisely North, North East, or South south West, or North and by East &c. or whether they bend somewhat more towards the East, West, north, or south, as when they lie north west, & halfe a point to the westward, or south east, & halfe a point or a quarter, or three quarters to the eastward, &c. The which way to finde the Rhombe generally is in this manner. Hauing found out in your plat the 2. places assigned, which I suppose to be M. N. lay a straight ruler vpon them (if you please, you may draw a line with a fine black lead from the one place vnto the other, extending it at large ouer the Carde, both aboue and beneath the 2. places assigned, but it is needlesse, for the laying downe of the ruler is as much as the drawing of the line) marke where the said ruler, or line if it bee drawne, cutteth any one Rhombe (which or whensoeuer it is) of North and South; as for example, the line M. N. cutteth the middlemost Rhombe of North and South in the point S. Then take the Semidiameter of the Circle. A B C D. namely the line A. E. and according to that Semidiameter vpon the point S. describe an arcke or peece of a Circle the shortest that may bee drawne betweene the Rhombe of North and South, and the line running betweene the two places in such manner as you see the arcke, T. W. Take the distance of the saide Arcke, T. W. and count it from the point B. or the point D. eyther to the right hand, or to the left, according as the situation of the line drawen betweene the two places assigned shall best aduise you, (that is to say, if your course lie Southward and to the East, then count the distance from D. towards C. if you runne Southward, and to the West, count the distance from D. towards A. But if you doe sette Sayle to the Northward Easterly, then reckon the sayd distance from B.

The generall way to finde the Rhombe.

toward

toward C. if your course bee betweene the North and the West, let the distance be accounted from A. toward A.) the Rhombe which shall be next vnto the foot of your Compasse, is it vpon which the two places assigned doe lie, & according vnto the Rhombe must your course be directed, if the winde will giue you leaue. As in this example, counting the arcke T.W. from D. toward A. I finde the foot of my Compasse to light precisely vpon the Rhombe of South Southwest, and therefore I say, that the Rhombe, vpon which M. and N. doe lie, and according to that point of the Compasse must my course be kept from M. to N.

P. But put case that the foote of my Compasse doth not light precisely vpon any one Rhombe, but betweene two of them, how shall I then say the places are situated and lie one from another?

M. In this case you must denominate the position or lying of the two places according to the Rhombe, which shall be found to be next vnto the foote of the compasses, adding these words, and a quarter, halfe, or three quartes of a point more to the South, North, East, or West, as you shal see occasion. This is the generall way to finde the Rhombe.

P. But I remember I saw the saylers worke otherwise.

M. You say true, for in searching out the Rhomb, or point of the compasse, they set the one point of the compasses on the place from whence they put, and ayming or gessing how the place vnto the which they goe may beare from it, they extend the foot of your compasses accordingly as the Rhomb requireth, at the which they gessed, directing the foot of their compasses vpon the said Rhombe from the place of their departure vntill they come vnto the place vnto the which they intend to goe: But trust mee Philomathes there is no way more ready & certaine, generally, then that which I haue set down, for if it be followed precisely according to my prescription, you cannot misse ỹ bredth of an hair in finding out any Rhombe betwæn 2. places assigned, because it brings forth the iust angle of position according to ỹ descriptiõ of ỹ card.

P. I hope practise will bring readinesse: What is the particular way to find out the Rhombe?

The particular way to find the Rhombe.

M. The particular way is that which requireth a certaine position, or situation of the two places assigned, & it is two-fold, having a double worke according as the two places are directly situated from, or neere vnto the Meridian. For this you may easily perceiue by your Card, and by common sense also, that sometimes the assigned place, to which you bend your course, may be very neere vnto the Meridian of the place, from whence you depart, sometimes the place to the which you goe, may be farre off from the Meridian from whence you set saile, and neere vnto the East or West point of the compasse: whereupon there ariseth a twofold worke in this manner to be performed. If the places lye neere the Meridian one of another, (namely if they lye not more then Northeast, or Northwest, Southeast, or Southwest, one from another) lay your ruler vpon them both, and marke where it cutteth any two of the parallel Rhombes, which runne East and West.

P. Doth it not make any matter which two parallels they be, which the ruler cutteth, whether they be in the middest, at the bottome, or at the top of the Card?

M. It is neither here nor there, which parallels you make choise of in the performing of this conclusion, but it is best to chuse those two parallels, which are nighest together, bee they whersoeuer (so that the ruler doth touch them both) for sauing of your labour in extending of your compasses, as for example: if that I were to goe from M. to N. I lay my ruler vpon them both, and find that it cutteth al the parallel Rhombes of East and West, from N. downeward in the points, a. b. c. d. and e. but I make choise onely of the two neithermost parallels, and with my compasses I take the distance betweene the two points d. and e. wherein the ruler cutteth the parallels.

P. When this distance is taken, what is then to be done, and how must I proceed to finde the Rhombe?

M. Your

M. Your compasses being kept at their extent, make choise also of the center of some one fire, being in either of the two foresaid parallels, (as for example) I make choise of the center E. which is in the uppermost of the two parallels: in that center E. I set the one foote of the compasses, and turne the other foote downeward to the other parallel, setting it precisely in the same: The Rhombe, upon which the foote of the compasses doth fall, is that, whereon the two places assigned doe bear one from another, as for example, I find the foot of the compasses to light iust upon the Rhomb of South Southwest, wherefore I conclude that to be the point of the compasse upon which N. beareth from M. and according to that (so neere as may be) must I shape my course.

P. Yet heere ariseth one doubt, which is this: when I set the one foote of my compasses in the one parallel, and turne the other foote toward the other parallel, is it not materiall which way I turne the said other foot, either to the right, or to the left hand?

M. Yes, it is greatly to be regarded, this must be your generall rule, namely, that as your ruler lieth, so must your compasses be situated, that is to say, the right line supposed to be drawne from the one foote of the compasses unto the other, must be parallel to the side of the ruler: so shall you be sure to finde out the Rhombe, because this is a principle, as it were, concerning the Rhombes described in the plat, that all lines eyther actually, or by imagination equidistant therein one unto an other, haue one and the same denomination.

P. And as I guesse, I must obserue that also in that rule which you taught me before, namely, that if the feete of my compasses being situated orderly, shall not precisely touch any of the Rhombes, then am I to entitle the position of the two places according to that Rhombe which shall bee nert unto the feete of my compasses, adding these words, and a little more to the Southward, or Northward, &c. As the fall of the compasses shall best aduise me.

M. You say well: Thus much concerning the first particular way of searching out the Rhomb, when the two places assigned lye neere to one anothers Meridian. But if it shall so fall out, that the two places assigned in your Plat lye not neere vnto one anothers Meridian, but beare almost East & West one from another, then can you not vse the former way conueniently, because either the compasses will not reach the two Parallels of East and West, as they did before, or else their extent will be very great, and the interiection of the ruler and the Parallels will be so oblique, that you cannot iustly discern where to pitch the fot of your compasses. Therefore in this case you shall worke thus: Lay your ruler vpon the two places assigned, and marke where it cutteth any two Rhombes of North and South (which hereafter for instruction sake I will call Meridians, because indeed they are so,) As for example, I lay the ruler vpon O and P. and finde it to cut all the Meridians from P. toward my left hand; but for the performance of this conclusion, I make choyce only of those two which are next vnto P. toward the said hand, the which Meridians are cut by the ruler in the points, f. and g. Take the distance of the two points, and setting the one fot of your compasses in any center of any line, which is in eyther of the Meridians (as for example, set it in the center W.) turne the other fot of your compasses about, vntill the other foot touch the other Meridian (prouided alwaies that the situation of your compasses be like vnto the situation of the ruler) the Rhombe vpon the said fot of the compasses doth either precisely light or come neerest vnto, is it, which giueth the denomination to the position of the two places assigned, whereby in this example I say that P. beareth from O. West and by South, and O. lyeth from P. East and by North. Thus much briefely for finding out the Rhombe either generally or particularly.

P. It followeth therefore now to speake of the degrees of Latitude.

M. You say true Philomathes, so our method doth require, that

that we should so proceed; but for so much as my experience in pricking of the Card is more then yours, I think it not amisse to teach you a conclusion (which is the conuerse of that which went before) because it is of great vse: you haue learned how to find out the Rhombe that thereby you may direct your course from place to place, now learn this also, From a point assigned in the Card whersoeuer to draw a line Parallel to any Rhombe assigned. But before I proceed I must aduise you of this, that the worde Rhombe in this proposition must be largely taken, as it was before, not only for any line direction vsually expressed vpon the Card, but also for any line by imagination concealed to be drawn between them, as that which is drawen southwest and halfe, or a quarter, or three quarters of a point to the Westward, and such like, whereupon we say that this conclusion may be wrought also generally or particularly. For this you know that sometimes we may name a Rhombe precisely & simply, without any addition, as when I say that from the point O. would haue a Rhombe drawn West and by South directly: sometimes we name a Rhombe with this additiõ, a quarter, half, or three quarters of a point more toward such or such a coast as when I say that from ẏ point I, I would haue a Rhombe drawen Southeast and by South, and half a point more vnto the Eastward: Howsoeuer the question is propounded, you shall generally absolue it thus. From the point assigned (as for example, from I.) draw an infinite right line (that is to say, a line long enough to serue your turne) Parallel to the nert Meridian line (if the point assigned be not in ẏ Meridian, for then this labour is saued.) Afterward with your compasses take the length of the semediameter ED. which is at the nether end of the Card toward the right hand, according to that semediameter vpon the point giuen, namely vpon I. describe an arcke or peece of a circle KL. 2. Proposition.

P. But where, or on which side of ẏ line shal I describe the said arcke: shal I describe it aboue, or beneath ẏ point assigned: again shall I describe it on the right or on the left hand:

M. You

M. You must describe ỹ forsaid arcke according as your course requireth, that is to say, if your course lie to the southward, Easterly, or full East, describe the arcke beneath the center or assigned point toward the right hand; if your course lye Southward, Westerly, or full West, describe it beneath the center or assigned point toward the left hand. If your course lie Northward, Easterly, or ful East, describe the forsaid arck aboue the assigned point toward the right; but if it be Northward, Westerly, or full West, describe it toward the left hand: as in the example propounded, because from the point I. it is required that I should draw a line Southeast and by South, and halfe a point more to the Eastward, therfore the forsaid arcke KL. is described beneath the center or assigned point toward the right hand.

P. Hitherto I vnderstand you: but let vs proceed, when as vpon the center or assigned point I haue described an arke according as my course directeth me, what must I then doe?

M. If your course lye Northward set the one foote of your compasses in the point B. which is on your right hand toward the bottom of the Card; but if your course lie southward, set it in the point D. & extend the other foote vnto so much of the circumference, as is contained between B. or D. and the Rhombe assigned, as in the example propounded, I extend my compasses from D. to the *Rhombe* of Southeast and by South, and halfe a point more vnto the Eastward, that is to say, I take the distance betweene D. and X. and then setting the one foote of my compasses thus extended in the beginning of the arcke, which I draw before, namely in the point K. with the other foot I make a marke in the same arcke in the point L. The right line drawen from I. (which is the point giuen) vnto L. is the line desired, Parallel to the *Rhombe* of Southeast and by South; and halfe a point more vnto the Eastward, for it maketh the same angle with the Meridian I K. which the line EX. maketh with the Meridian E D.

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This is the generall and most certaine way of drawing the *Rhombe* from a point giuen. But if it so fall out that the *Rhombe*, which is to be drawen from the point assigned, bee simply named without addition of half a point more or lesse toward such, or such a coast, then you shall describe the said *Rhombe* thus. Among al the lines described ouer the face of the Card, seeke out (so neere vnto the assigned point as may be) such a line as beareth the same denominatiõ with the desired *Rhombe*: as for example, if from the point Q. you were enioyned to draw a *Rhombe* Southwest and by West, seek out a line that may beare that denomination; (the which as it falleth out in this Card, is that line that commeth from the Westermost part of England to the Iland of Faial among the Acores, namely the line y. *Z.*) Then setting the one foot of your compasses in Z. (that is, in the assigned point) put forth, or pull in the other foote so long, vntill you may but touch the line y. Z. Afterwards set the one foot of the compasses in some other place of the line y. Z. either to the North or Southward as the desired Rombe shall best aduise you, as for example in the point Z. and with the other foote make an arke or a circle, on that same side of the line, vpon which the assigned point is, namely the arcke *R.* the right line drawen from Q. the point assigned to the toppe of the said arcke is Parallel to the *Rhombe* desired. Thus much concerning the finding out of the *Rhombe*, and the manner how to draw a line Parallel vnto any of them from a point assigned. Let vs now proceed Philomathes to the vse of the degrees, which consisteth in this especially, any place being assigned in the Card to finde the Latitude thereof.

P. By the Latitude you meane the distance of any place from the Equinoctiall either to the North or Southward, according as is commonly taken in Geographical matters.

M. I doe so vnderstand it, and heere you must note also, that forsomuch as the Latitude of any place, and the height of the Pole at the same place are all one in number, though they be counted in seuerall manners, & from diuers places,

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(for the Latitude as you know is counted from the equator toward the Zenith, or vertical point in the heauen right imminent ouer the place wherein we are; but the height, elevation, or Altitude of the North Pole is counted from the Horizon to the Pole it selfe) therefore they are vsually confounded, & we say that by the card we may finde in what height any place is, or what Altitude or eleuation the Pole hath aboue ỹ Horizon of any place expressed in the Card: whereas in truth the degrees commonly expressed in the Card are not the degrees of the eleuation of the Pole, but the degrees of Latitude. The which Latitude of any place assigned is found out thus.

Set the one foot of your Compasses in the place assigned, (as for example in the point O) and with the other foot take the shortest distance from thence to the next Parallel of East and West, either aboue or beneath it, so that your compasses being stretched forth, you may but touch the parallel. Then running with your eye along that Parallel toward the Scale of Latitude, marke where the Parallel cutteth the said scale, there set the one foot of your Compasses, & turne the other either vpward or downeward in the same Scale, as the place assigned shall best aduise you. The degree vpon which the foote of the Compasses lighteth, expresseth the Latitude of the place, and consequently what height you are in.

As in this example you shall finde the point O, to bee the 40. degree of Latitude. And heere you are to note that if the place assigned be in any Parallel of East and West, then is your labour saued, for the Parallel it selfe directeth you to the Latitude.

A briefe rule concerning the finding out the Latitude.

P. I perceiue your meaning well: and mee thinketh I could frame a short rule vnto my selfe thereby to finde the Latitude in this manner. If from the place assigned to the Scale of Latitude there be a right line drawen Parallel to the Rhombe of East & West, the degree of the scale, vpon which the said Parallel lighteth, expresseth the Latitude sought for:

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as you may perceiue by the line O.G. which cutting the scale of Latitude in the 40. Degrée, expresseth the Latitude of O.

M. Your rule is good: And heere you are to note, that when you search the Latitude of any smal Iland in the Card you must take your measure from the middest thereof.

P. In searching of the Latitude of many places, there is one thing that troubleth me, because I know not what to say certainly. When my compasses light precisely vpon the beginning or end of a Degree, then can I tell the iust Latitude of the place, because the seuerall numbers adioyned expresse the same: But if the Compasses fall betweene the beginning and ending of a degree, what shall I then say?

M. If the foote of your Compasses falleth iust in the middest of a degree, there are 30. minutes to be added to the number of the whole degrées: if it falleth on the 4. part, you must adde 15. minuts: if on the third part, you must adde 20. minutes.

4. Proposition. How many minutes are contained in each part of a degree

P. I grant that also, but considering that this Card yea and very few others haue such subdiuisions into quarters or tertes of a degree, I pray you giue me some generall rule whereby I may know what minutes are answerable vnto any part of a degree contained betweene the beginning of the said Degree, any pricke made at all aduentures within it.

M. If you doe remember it, I deliuered vnto you such a conclusion in that Booke, which I wrote concerning the vse of both the Globes, Terrestriall and Celestiall. The selfe same rule which I did there write touching the Degrees of a circle, eyther of the Globe, quadrant, or astrolabe, may bee here applied to a right line diuided into degrees. Therefore when as the foot of your Compasses lighteth betweene the beginning and ending of any Degree, and you are desirous to know what number of minutes that part of the degree may containe, which is betweene the beginning of it and the foote of your compasses, you shall satisfie your selfe in this manner. Take the portion of the degrée assigned, and begun-

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ning at the nethermoſt degrée of the card, count it frõ thence vntill you haue reckened 60. times, noting well where you make an end, for the number of the whole degrees comprehended betweẽ the degrée whereat you firſt began, and the point wherein you ended, expreſſe the number of minuts cõtained in the portion of the degrée propoũded. Otherwiſe to auoid the tediouſnes of turning the compaſſes ouer ſo many times, you may do thus: count the ſaid portion of the degrée 5. times ouer, noting well where your compaſſes lighted at the firſt time, from thence extend the foote of your compaſſes vnto the degrée whereat you began, & from that degrée coũt the ſaid diſtance 12. times ouer, noting well where your cõpaſſes lighteth at the 12. time, for (as I ſaid before) the number of the whole degrées cõprized betweẽ the degrée, whereat you firſt began, & the point, wherin you ended expreſſe the nũber of minutes contained in the portion of the degrée propoũded. Now if it ſhal ſo fall out at any time, that the portiõ of the Degrée betweene the beginning of it, and the foot of your compaſſes ſhall be ſo little, that your compaſſes cannot be brought cloſe enough together to take it (as many times it falleth out by reaſon of the ill workemanſhip of the compaſſes) then take the portion of the degrée remaining, contained betweene the foote of your compaſſes, and the end of the ſaid degrée, count that portion as you did the other, noting how many degrées of the ſcale of Latitude are contained betweene the place where you began, & the point wherein you ended, that number of degrées being ſubducted from 60. expreſſe how many minuts are contained in the foreſaid ſmall portion. Moreouer, if the number of the degrées in the ſcale of Latitude be ſo few, that you cannot account the portion of the degrée aſſigned 60. times, then count it but 30. times, and double the degrées contained betweene the beginning & the end of your account, or elſe count the ſaid portion but 15 times, and quadruple the ſaid degrees. So ſhall you alſo find the minutes. As for example, if in counting the portion of the degrée aſſigned 15. times ouer, you find 11. degrées and a

quarter

quarter to be contained betweene the place whereat you beganne, and the place wherein you ended, multiplie those degrees and the quarter by 4. and you shall find 45. minutes to be contained in the portion of the degree assigned.

P. Now tell me this I pray you, were it not good that the degrees of Latitude were greater?

M. It were good indeede for him that is but a young Scholler in pricking of his Card, but otherwise to an expert and cunning man it is neither here nor there, though they were halfe so small againe: And I will teach you hereafter how you shall keepe your trauerse vpon your Card though the degrees of Latitude be but small, as well as if they were two inches long.

P. Let vs now proceed to the scale of leagues, what vse hath it?

The vse of the scale of leagues.

M. The vse therefore is to finde out the distance betweene place and place: So that the conclusion to bee performed thereby it is this: two places being assigned to finde their distance. In working of this conclusion, this is to bee noted, whether the places giuen are of lesser distance, or farther off one from an other, thē the length of the scale amounteth vnto. If the two places bee of lesses distance then the length of the scale (as the points I and H are) extend your compasses from the one vnto the other, and apply them afterward to the scale of leagues (begining at the left end thereof) and you shall finde the distance of the places assigned eyther according to the English or Spanish account. But if the distance of the places assigned surmounteth the length of the scale of leagues, then with your compasses take either ỹ length of the whole scale, or some certaine nũber of leagues, as 20. 40. 50. or 100. and lay your ruler vpon the 2. places assigned, or else with a fine blacke lead draw a line from the one vnto the other, afterwards beginning at either of them, count the number of leagues which you tooke out of your scale (keeping your cõpasses close by the rulers side) as many times as you can betweene them: Still adding ỹ number of

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the leagues as you goe on. If at length the fot of your compasses lighteth iust vpon the other place assigned, then doth the totall summe of the leagues added together expresse the distance of the 2. places. But if in setting the fot of the compasses forward, you find that it falleth beyond the place propounded, then bearing in mind the totall sum of the leagues already reckoned, & pulling in the foot of the compasses vntil it touch the place assigned, & applying them vnto the scale of leagues, you must adde ỹ leagues contained betwœn their feet, vnto the summe found out before & noted in your mind, for the total number expresseth the distance of the places assigned. As for example, desiring to find the distance betwœn I and R (the which point R is neere the Iland of S. Marie.) I take out of the scale 50. leagues, and counting the said by the edge of my ruler 4. times, which make 200. leagues, and turning the foote of my compasses the fifth time toward the place assigned, I find that it ouer-reacheth the place: wherefore bearing in minde the former 200. leagues, I pulled in my compasses vntill the fot touched the place assigned, and applying them vnto the scale, I found 87. leagues to be contained betwene their feete, which bering added vnto the other 200. declare the distance of the two places to be 287. leagues, according to the English account.

P. In good time were those words mentioned, for looking vpon the scale of leagues, I found on the vpper part thereof these words, English leagues; and vnder it, Spanish leagues: what meanes these words?

M. They are there set to signifie the difference betweene vs and the Spaniards in counting of distances. Wee attribute vnto euery degree on earth (that is vnto the 360. part of the Compasse of the earth) 20. leagues, each league containing 3. miles, so that wee make the whole Compasse of the earth to be 7200. leagues, or 21600. miles. The Spaniards hauing their miles longer then ours, attribute vnto each degree but 17. leagues & a halfe, so that by their account the circuite of the earth is 6300. leagues, and one of

their

their miles is vnto one of our sesquiseptima, that is, as 8. is to 7. and seuenty of their leagues make 80. of ours. Whereupon you shall note this, that many times two places are said to be of a diuers distance one from another, yet are the places set where they ought to be, & there is no error in the Card, but the difference ariseth vpon the account diuersely made betweene vs and the Spaniards. As for example, from cape Finister vnto Porto Santo (according to the Spanish account) are two hundred leagues, but according to our account it is more by 24. wherefore in pricking your card you must haue a diligent eye to your scale, lest in mistaking the one kinde of leagues for the other, you mis-reckon your selfe, and finde fault with your Card where there is none. Is there any thing else which you would craue concerning the Scale?

P. Yea, I haue a question or two to be asked. If there be no scale in a Card, what shift shall I vse to make one?

M. I told you euen now that euery degree according to the English account is twentie leagues, therefore fiue degrees are one hundred leagues, and two degrees and a hal e are fiftie leagues; so that if you take fiue degrees of the scale of latitude, and diuide them into tenne parts, each portion shall be ten leagues, and ech of them diuided into fiue parts, are two leagues. But if you diuide the fiue degrees into 8. parts, then is each part twelue leagues and ½. The Spanish Scale is thus made, 80. English leagues as I said before, are but seuenty Spanish, therefore if you take foure degrees of latitude, and diuide them into seuen peeces, each portion is ten Spanish leagues.

P. I perceiue that I may make my scale of leagues by the degrees of latitude. I pray you therefore contrariwise tell me, when the Card hath no degrees of latitude, but a scale of leagues, how shall I finde out the length of the degrees of latitude whereby the Card was made?

M. The quantitie of each degree of latitude is easily found out by the English leagues, because one hundred Eng-

glish make iust fiue degrees: but if the leagues be Spanish, you must diligently note this, whether the greater diuisions of the scale containe seuerally ten leagues or twelue and ½. If they containe ten leagues apeece, seuen of them diuided in foure parts make foure degrees; but if the foresaid parts be each of them twelue leagues and ½, then take seuen of the, which amount vnto 87. leagues and ½. and diuide them into fiue peeces, which make fiue degrees of latitude, euerie one containing seuentæne leagues and ½.

P. The third thing which I stand in doubt of is this: when the Carde hath neither degrees of Latitude, nor scale, how I shall make them both?

M. This cannot be done, vnlesse that the distance betweene some two places in the Card be certainely knowne, and then it may be gathered out of that which hath been said before, especially if the two places assigned lie North and south one from another. As for example: if I know that the distance betweene Cape Vincent and the Rocke, is 40. English leagues, or two degrees of Latitude, I may out of that distance easily gather the quantitie of my Scale of Leagues and Degrees.

P. Let vs now proceede: Hitherto wee haue spoken of the Rhombes, of the Scale of Latitude, and the Scale of Leagues, as they were to be considered seuerally each one by it selfe; what is to be considered in them being iointly vsed and linked one with another?

5. Proposition. M. There arise out of them (being ioyned together) many conclusions: As first of all this: The Rhombe being giuen, and the Latitude, with which you fall, to finde the distance or the way which the Shippe hath made from any place assigned. The performance of the which proposition may thus briefly be deliuered. If from the place assigned there be a right line drawne parallel to the Rhombe assigned, and from the degree of Latitude there be another line drawne equidistant to the Rhombe East and West, cutting the foresaid line in some certaine place: The length of the

the right line contained betweene the point of the intersecti-on where the cut is made, and the place of your departure, being applyed to the scale of leagues, expresseth the distance or the way which the Ship hath made.

As for example: I suppose that from the point N. I went South and by East three quarters of a point more to the Eastward, vntill I fell with the forty degree of the latitude. Therefore (by the second proposition of this booke) from N. I draw a line parallel to the Rombe of south and by east, &c. and from the fortieth degree of latitude, I draw another line parallel to the Rhombe of East & West, the two lines drawne concurre and met in the point O: the length of the line N. O. applied to the scale, expresseth the distance to be 75. leagues. Another conclusion is this: The distance or way, which the Ship hath made, being giuen, and the Rhombe, to finde in what latitude you are. The proposition is thus per-formed. If in the right line drawne from the place assigned parallel to the Rhombe giuen, be limited according to the Scale of leagues, the distance or way which the Ship hath made, the right line drawne from the end of the said distãce parallel to the Rhombe of East and West that cut off in the Scale of Degrees the latitude sought for. As for example: frõ N. I went South and by East three quarters of a point more to the Eastward seuenty fiue leagues, I demaund with what latitude I fell. From N. I draw a line paral-lel to the Rhombe of South and by East, &c. (by the second proposition) in the which line I account the distance, that is, seuenty fiue leagues from N. to O: then from O. I draw a right line parallel to the line of East and West, which cutteth the Scale of Latitude in the 40. degree, which is the degree sought for. 6. Proposition

The third conclusion is this: The distance being giuen, and the Latitude, to finde the Rhombe, your rule is this: If from the Latitude giuen towardes the place assigned, there be a right line drawne parallel to the Rhombe of East and West, and on the place assigned being the center, 7. Proposition.

there be a circumference described, hauing for his Semidiameter the distance giuen, and cutting the foresaid Parallel at all aduentures in a point on that side of the meridian, on which your course doth lie, the right line drawn from the place assigned vnto the said point wherein the section was made, shal expresse the Rhombe desired. As in this example: Suppose that going from N. 75. leagues, I found my selfe to be in 40. degrees of latitude, I would know vpon what Rhombe my course was made.

From the fortieth degree of latitude, I drawe a line O G. parallel to the Rhombe of East and West. Then with my Compasses I take out of my scale 75. leagues, and setting the one foote of them in N. (that is, in the place assigned from whence I departed) with the other foote, on the right side of the Meridian, because my course lieth Easterly, I make a circumference, cutting the line O G. in the point O. I draw a right line from N. to O. which by the first proposition I finde to be the Rhombe of Southeast and three quarters of a point more into the Eastward, vpon which I made my course.

P. In making of the circumference mentioned in your rule, why do you bid me cut the Parallel on that side of the Meridian on which my course doth lie?

M. Because the Parallel line which is drawne from the scale of Latitude, may be cut as well on the East as on the West side of the Meridian from whence you depart, and therefore in answering to the former proposition, there is a secret consideration to be had with your selfe, which way your course doth lie, whether to the right or left hand of the Meridian, the which consideration being had, and the compasses being guided accordingly, we may easily finde out the Rhombe.

P. These three conclusions me thinketh should be not only pleasant, but also very commodious for the Saylor, because by either of them he may easily and readily finde the place wherein he is, which (as I remember) they called the

pricking

pricking of the Card: for the point wherin the Rhombe assigned, and the latitude; or the assigned Rhombe, and the distance; or the assigned latitude and the distance do concurre, expresseth the place wherein he is.

M. You say true Philomathes, and for so much as there are three things whereby the sea-faring man may help himselfe by meanes of this Card, that is, his latitude, his distance or way which his ship makes, and the Rhombe, vpon which he shapeth his course, hereby he may assure himselfe two of them being giuen (namely the Rhombe and the latitude, or the Rhombe and the distance, or the latitude & the distance) whether he hath erred in the other yea or no, and how much he hath erred. As for example: If in sayling from N. to O. South and by East three quarters of a point more into the Eastward, & finding my selfe to be in the 40. degree of latitude, I shall affirme that I haue runne 75. leagues, by the first of these three conclusions which is the fifth proposition, I shall certifie my selfe whether I kept the reckoning of my way true, yea or no: for my compasses being extended to that number of leagues, and the one foot of them being set in N. if the other foote reacheth iust vnto the point O. wherein the Rhombe and the latitude are supposed to concurre, I may assure my selfe that my distance was truely obserued. But if the foote of the Compasses shall fall either short off, or beyond the point O. then haue I erred in obseruing the way of the shippe, and the distance betwixt the foote of the Compasses and the point O. being applied to the scale of leagues, expresseth the quantity of mine error. Secondly, if by the diligence of mine obseruation I can assure my selfe that I haue run South and by East, three quarters of a point more to the Eastward 75. leagues, and at length obseruing the Sunne or Starre, shall auouch that I am in the 40. degree of latitude: then pricking out my course vpon the Rhombe from N. to O. if that the right line drawn from the 40. degree of latitude parallel to the Rhombe of East and West, doth not precisely concurre in the point O. but falleth either

aboue or beneath it, then haue I erred in taking my latitude, and the quantity of mine error is bewrayed by the shortest line drawne from the point O. to the said parallel. In like maner, if by my obseruation precisely made, I can warrant my selfe of my distance and of my latitude, and shal auouch, that from the point N. I went South and by East three quarters of a point more to the Eastward. If from the point N. I draw such a Rhombe (by the second proposition) and it shall not concurre in the point O. wherein the latitude and the distance do cõcurre, then may I say that I haue erred in the Rhombe, and the quantity of mine error is to be found by the arcke of the circumference contayned betweene the point O. and the Rhombe drawne.

P. I perceiue that these things do follow, and are conueniently inferred out of the three former conclusions; but may they be taken as certaine and true?

M. Oh Philomathes, you know I told you before, that the plaine Card was not in all points correspondent to the dimensions of the Globe, and therefore there cannot a most exquisite and a precise truth be warranted thereby: but for so much as the common Mariner (the more is the pity) hath no better helpe, I teach him and you, how to make a benefit and a pleasure vnto himselfe of that which he hath, so farre forth as the thing it selfe will permit him. Let vs now proceed. This also may be performed vpon the Card: Two places vpon the shoare being knowne, and the point of the Compasse, vpon which they beare from you, to finde how farre distant you are from the shoare, in a direct course, or from either of the two places.

The eight Proposition.

P. But is it not materiall, whether I be thwart of the one of the two places yea or no?

M. It maketh no matter: let them lie from you howsoeuer, so that you and the two places be not in a right line. Your rule is this. If from the two places assigned there be Rhombes drawne opposite to the two Rhombes vpõ which the two places do beare: the distance between the concurre

of

of those two Rhombes and the shore, or the places assigned, will expresse how far off you are from either of them, or from the shoare it selfe.

P. What meane you by the two Rhombes which are to be drawne opposite vnto the Rhombe, vpon which the two places do beare?

M. This is my meaning, that if the one place doth lye East and by north, you should draw a Rhombe from it west and by South; and if the other place lye East southeast, you should draw a Rhombe frō it west northwest. For alwaies the concourse of the opposite Rhombes wil expresse the place wherein you are, which being once knowne, you may by the scale of leagues easily gather how farre you are distant from any place. Moreouer vpon the Card this may be performed: The Rhombe and the distance being giuen to finde how we haue raised and let fall the Pole. For if in the Rhombe assigned (as for example) in the line N O. we count the distance vnto the point O. from the point N. the parallels drawne east and west from the points N. and O. shall in the scale of latitude comprehend betweene them the degrees which wee haue shifted in the height of the Pole. The ninth Proposition.

P. Now that you haue made mention of raising the Pole, I pray you tell mee, may not this conclusion be wrought vpon the Card, in raising or letting the Pole fall a degree, to finde how many leagues we runne vpon any Rhombe assigned? The tenth Proposition.

M. Yes that you may Philomathes, and that so much the better in that the question is but of one degree, for in many degrees the errour would appeare, as may be gathered by that which hath beene sayd heretofore concerning the proiection of this Card. And forsomuch as each seuerall degree of this Card is somwhat too litle whereby to worke this cōclusion cōueniently, therefore suppose that 5. degrees of your card were but as one, then must each degree be 4. leagues, & halfe a degree must be 2. leagues: this being supposed, make choise of some one center of a flie within your card, as for example,

I chose the center D. wherein the Rhombes do concurre on the left hand of the Card: aboue that center from the point F. which is distant from D the length of 5. degrees counted notwithstanding but as one, I draw a right line parallel to the Rhombe of east and west, cutting the Rhombes proceeding from the point D. in the points a,b,c,d,e,f,g. Then making the line DF. your scale, (the which because it is supposed to be a degree) it must of necessity be accounted for 20. leagues; if you measure therwith the lines Da, Db, Dc, Dd, De, Df, Dg. you shall easily finde how many leagues you runne vpon any Rhombe, in raising, or letting the Pole fall a degree.

21. Propo. P. Out of this me thinketh also that I may inferre an other conclusion, which is this: The Pole being raised or let fall a degree, to finde how farre I am distant from my meridian running vpon any Rhombe assigned.

M. You say true: for if by the said 5. degrees taken but for one, being in quantity 20. leagues, you measure the distance betweene the points F. and a. F. and b. F. and c. &c. you shall finde the distance betweene the meridian and each seuerall Rhombe. These conclusions Philomathes, aforesaid, being noted diligently, it followeth now to teach you that, which is the summe of them all, wherin they must all iountly concurre together, the which conclusion is this: How to

22. Propo. keepe your traueric vpon the Card. The which proposition though it be in words differing from the rest, yet is ther nothing in it, which hath not beene seuerally deliuered in the former propositions, so that it requireth onely a derterity in practising, and working that which you haue learned, as shall appeare in this example. Suppose that I were to goe from H. to Saint Maries Iland, the which two places as it may appeare by the first proposition do beare one from an other southwest and by south two thirds of a point more vnto the westward, and by the fourth proposition I finde them to be 332. leagues asunder, but making my course vpon the foresaid Rhombe, I was no sooner from the shore, but I was

carried

carried first with an easterly wind 100. leagues to the west-ward. Secondly, I was carried from thence to the South east a quarter of a point more to the eastward 90. Leagues. Thirdly, the winde comming about, I was carried South southwest 72. leagues. Fourthly, I was driuen by tempest south and by east three quarters of a point more vnto the eastward I know not how farre, but I found my selfe to be in the 40. degree of latitude. Fiftly, I was from thence enforced West and by South 60. leagues. Sixtly, I was with a contrary winde put North northeast 40. leagues. Seauenthly, I ranne 160. leagues I know not vpon what Rhombe certainly, but it was to westward of the meridian, vntill I shifted my Pole foure degrees and a quarter. I demaund in what place I might be, and what Rhombe it was vpon which I ranne last. 2. What Rhombe I should haue kept to the place wherein I finde my selfe to be, if I had not found the wind contrary. 3. How many leagues I am from the place of my departure. 4. How I haue shifted the Pole. 5. How farre I am from my Meridian. 6. How many leagues I haue to R. 7. What Rhombe will set my course thither.

P. If it please you sir, I will see how I can answer the question.

M. Do so, it will be good for you alwayes to practize that which you know.

P. First, by the fourth proposition from H. westward I count 100. leagues to the point I. Secondly by the 2. proposition I draw the Rhombe of South East a quarter of a point more to the Eastward, from the point I. to L. and in it from the said point I. count 90. leagues to the point M. Thirdly, by the second proposition from the point M. I draw the Rhombe of South south West, and count therein seauentie two leagues from M. to N. Fourthly, by the 1rt proposition I finde my selfe to be in the point O. which is in the fortie degree of Latitude and 75. leagues from the point N. Fiftly, by the second and fourth propositions I finde

my

my selfe to be in the point P. that is, west and by South 60. leagues from O. Sixtly, by the forenamed propositions, I finde my selfe to be in Q. which is North Northeast fortie leagues from P. Last of all by the seuenth proposition, I answer that I finde my selfe to haue kept my course southwest and by west, and to be at the point R. Secondly, if I had not beene molested with contrary windes, I might haue runne Southwest and by South halfe a point more to the Westward. Thirdly, I am three hundred thirty two leagues from H. Fourthly, I haue shifted the Pole thirteene degrees $\frac{1}{4}$. Fiftly, I am from the Meridian of H. according to this projection of the Card, two hundred foureteene leagues. Sixtly, I haue vnto the Iland of S. Maries, aboue twelue leagues, and I must set my course thither westerly.

M. You haue answered the question Philomathes directly: here might we make an end of the vse of the sea Card, were it not that I remember you propounded vnto me a question heretofore concerning the degrees of Latitude: whether it were not better for the Mariners vse, if they were greater then they be vpon this Card: I must confesse, that generally all instruments Mathematicall to be vsed either by land or sea, are so much the more commendable, by how much the more they exceed in quãtity: but touching the plaine sea card though it be but of a very small pricke, yet may it be vsed as if it were two, foure, or eight times so great againe as it is. For as for the Rhombe they serue our vse in a small Card as well as in a greater, and that so much the better by how much they come the nearer together; so that the Compasses neede not so large an extention on the small Cards as they require vpon those which are of a larger pricke. As for the smalnesse of the degrees of Latitude, they may be remedied by supposing two, foure, or eight degrees to be but as one; and so likewise may the leagues be taken 20. or 10. or for 5: and 100. may be supposed to be but 50. or 25. according as you alter the proposition of the degrees of Latitude.

P. I pray you make this thing plaine vnto me, I doe partly

partly perceiue your meaning by your former words, but I would haue the matter laid open more manifestly.

M. When as the degrees of Latitude in your Card, and the leagues of the scale doe seeme to be too little for your vse; First of al seek out in it by the first proposition, the Rhombe vpon which the place, whither you go, beareth from the place of your departure; seek out also the latitude of the place from whence you depart. Then suppose so many degrees of latitude in your Card (as you thinke good) to be but one, (for example sake suppose 4. of them to be but one, so that each seuerall degree by this supposition is but a quarter, and each halfe degree is but halfe a quarter: and consequently in the scale of leagues tenne degrees are but twenty, and twentie are but fiue, and the small space betweene the prickes is but halfe a league) according to this supposition you must pricke your Card and keep your trauerse.

P. That I know, but when I haue kept my trauerse according to that supposition, how shall I reduce the place, wherein I find my selfe to be by my trauerse, vnto my owne Card, that my card being neuer so litle, I may say that this, or this is the place wherein I am: As for example, if I were to go from Cape S. Vincent to Porto Santo, my course lieth Southwest and by west. And this I perceiue that I should suppose euery 4. degrees of this card to be but as one, I must suppose Porto Santo to lie from Cape S. Vincent 4. times so farre as it doth. Now say that I ran from Cape S. Vincent West Southwest 60. leagues, then by the former supposition, I must needes be in the point Z. which in the Card is beyond Porto Santo a great deale to the westward, whereas I should be betweene Cape S. Vincent and Porto Santo; therefore I pray you tell me how in my Card I may make a pricke representing the true place wherein I am.

M. This thing Philomathes is most easily done, if you marke the proportion of your supposition. You suppose 4. degrees to be but as one, therfore the point Z. is 4. times so far from Cape S. Vincent as it should be, so that if you diuide the

length

length of the line betweene the Cape and the point Z. into foure parts, the fourth part is the true distance from the Cape. In like maner if you would know the latitude, wherein you are according to your Card it selfe, diuide those degrees of latitude which are contained betweene the latitude of Cape S. Vincent and the latitude of the point Z. into foure equall parts; for the fourth part giueth the latitude wherein you are.

This thing Philomathes, is worth the obseruing, for by this means you shalbe able to vse your Card, of what quantity soeuer it is.

P. I doe now vnderstand better then I did before, and I obserue this as a generall rule, that I must alwayes follow the proportion of my supposition in finding out either the true latitude or the true distance: for as touching the Rhombe that keepeth still his denomination. So that if I should suppose two degrees of my Card to be but one, then must I take halfe the supposed distance for the true distance: and if I suppose eight degrees to be but one, I must take the eight part of the supposed distance to be the true distance, and in like manner must I doe in finding the true Latitude.

M. You say well Philomathes. And here you are to note that you may suppose the place of your departure to be in any place of your Card where you thinke most conuenient to keepe your trauerse (or if you will, you may keepe your trauerse vpon some blacke skinne which hath nothing in it but the lines) imagining the degrees to be as great as you please, and afterward you may apply it to your Card by the vertue of the first proposition, which teacheth you the Rhombe being giuen and the distance, to finde the true latitude, and consequently the place wherein you are, the said Rhombe being drawne, and the distance accounted in your Card from that place, from the which you departed. Moreouer if it shall so fall out, that beyond the Ilands or other coast of the land set downe in your Card, there be

not

not scope enough for you to trauell, either East, West, North, or South, (as for example in this your carde, there is not space enough to trauell either from the Terceras Westward, or from the Canaries Southward) you may by the former rule suppose any place in your Card to be the place wherein you are, and afterwards kéep your trauerse at your pleasure.

Thus much briefly Philomathes concerning the vse of this plaine Card, wherein if I haue satisfied you to your contentment, I shall be glad; but this I could wish, that you should not alwayes addict your selfe vnto this kinde of plat, but labour and striue to be cunning in any other that are extant, that comparing the one with the other, you may make choise at the length of the best, although in the meane season you vse this as an helpe in your trauell. And thus: &c.

P. Now stay a while sir I pray you, there is yet one thing to be spoken of; which are the cyphers set round about the two flies, whereof the one is at the bottome, the other at the top of the Card: I would faine know to what purpose they are.

M. You remember that in the tenth proposition, wee spake of the leagues, which we runne vpon euery point of the Compasse in raising or laying the Pole a degrée; these leagues are expressed in the vppermost halfe of that Circle which incõpasseth the great flie at the bottome of the card, from A to B, and from B to C, and are adioyned to each Rhombe, or point of the Compasse, whereof those, which are on the quarter A B are the English, the other on the quarter B C are the Spanish leagues.

Moreouer in the eleuenth proposition, wee spake of the distance from the Meridian, in raising the Pole or letting it fall a degrée, sayling vpon any Rhombe assigned. Those Leagues, both English and Spanish, are likewise expressed vpon the nether halfe of the Circle, that they might be ready for those which are desirous to know them vpon a sodaine

without

without the vse of the Compasse. The other cyphers which are set about the Flie at the top of the Carde, serue for the finding out of the height of the Pole by the North or Pole-starre, according as it is pointed with the guardes: So that by the placing of the foresaid figures you are to note this, that the former guards being in the East, the North starre is one degree and an halfe vnder the Pole, and therefore you must adde so much (for so the letter A. doth signifie) to the height of the Starre, that thereby you may finde the true height of the Pole.

Item, the guardes in the West the Starre is one degree and an halfe, aboue the Pole, and therefore you must subduct so much (for so the letter S. doth signifie) from the height of the Starre to find the height of the Pole. In like maner you are to adde or subduct the numbers set vpon the other points of the Compasse vnto or from the height of the north starre, according as the letters A. and S. do direct you. These things Philomathes, the Saylers by their long experience, haue noted to be auaileable for their vse, and therefore they haue thought it good to point them into their Cards; the which things you may apply also to your commodity as occasion serueth, hauing the meaning thereof layd open vnto you, hereafter I will be ready to further you in any other Mathematicall conceit, to the vttermost of my power.

P. I know it well, and haue had much experience of your good will, and therefore I thanke you, and I acknowledge my selfe a debtor for the same. But before we part, I pray you let me haue your opinion in this; what thinke you of Mercators Card? and wherein differeth it from the plaine Card?

M. Philomathes, I iudge it to be an excellent worke in respect of the proiection thereof, and might (by inlarging of it) be made most fit and conuenient for the Saylers vse: it differeth from the common Card in this, that the degrees of Latitude are not equall, but waxe greater and greater toward the Pole, whereby there ariseth a double commodity, for;

for by this meanes the land is not so distracted as it is vpon Plancius his Map, who followeth the proiection of the plaine Card, and it cometh very neare vnto the Symmetry of the Globe, because the degrées of Latitude are so proiected, that each one of them may be the scale to measure iustly the circumference of that Parallel which runneth through the end of the said degrée, so that you may truely measure the distance betweene East and West, and it is therefore the best Card, that euer I saw extant, whereon you may keep an account of your Longitude. In the vse of it the degrées of the Equinoctiall are the common scale to measure any distance assigned, and your reckoning must be kept, not vpon the Rhombe, vpon which your course lieth, but vpon that Rhombe, which is so farre distant from the Equator, or Parallel of East and West, as the Rhombe vpon which you made your course, was distant from the Meridian. Thus much (Philomathes) concerning that matter, I feare my speech séemeth darke vnto you, and my leisure will not now serue me to shew you the booke, which I haue written concerning the vse of Mercators Card. Hereafter, when more leisure shall serue, I will be ready to let you haue the sight of it.

P. I thanke you, in the meane time I bid you farewell.

FINIS.